

**1937**

**MASTER CATALOG**

**of**

**AIR CONDITIONING**

**& REFRIGERATION**

**Equipment, Accessories, Parts, Materials, Supplies and Tools**

**THE RED BOOK**

## In response to an active demand

### Beverage and Food Coolers

Anderson Radio & Electric Co.  
Elizabeth City, N. C.

Kindly send us a complete list of all refrigerator manufacturers that are making a beverage cooler, especially those who are making a combination beverage cooler and food cooler.

WM. J. ANDERSON, Sec'y-Treas.

### New Dealer

George S. Jarvis  
Oil Leases, Royalties, and Real Estate  
Sayre, Okla.

I am planning on the sale and installation of Air Conditioning Equipment, especially for homes already constructed. I would appreciate very much your furnishing me a list of your manufacturers manufacturing this kind of equipment. GEORGE S. JARVIS.

### More Air Conditioning

American Wholesale Furniture  
and Mfg. Corp.  
Wichita at William St.  
Wichita, Kan.

Appreciate if you would give us a complete list of firms that make air-conditioning equipment. Also, combined air-conditioning and heating equipment. W. E. DIXON

How many new "factors" will enter the air conditioning and refrigeration industry in 1937?

What types of business firms will be most successful in selling air conditioning and refrigeration equipment next year?

How is it possible to get in contact with those concerns entering the business as distributors, dealers, contracting, installation and service companies?

The need of information by all factors of the industry is clearly reflected in the daily mail at the offices of Air Conditioning and Refrigeration News. A few sample letters are reproduced on this page.

The Red Book (1937 Master Catalog of Air Conditioning and Refrigeration Products) is planned to meet this active demand for information.

An extensive survey of the entire industry is now being made and requests for copies of The Red Book are arriving daily.

The list that is now being compiled and which will receive The Red Book, it is believed, will comprise the most comprehensive and active list of "prospects" ever offered to the industry. Publication date will be March 1, 1937.

Products will be grouped into eight major classifications as follows:

1. Air Conditioning Equipment.
2. Commercial Refrigeration Equipment.
3. Household Refrigeration Equipment.
4. Accessories.
5. Unit Parts.
6. Materials.
7. Supplies.
8. Tools.

To manufacturers desiring complete coverage of the entire market, including manufacturers, distributors, dealers, contractors, jobbers, installation and service organizations and large buyers, The Red Book offers a very exceptional opportunity. It can be used effectively and at low cost as an important part of the 1937 sales promotion program. Write for rates and complete information.

### New Jobber

Jas. J. Kline

Household—All Makes—Commercial—Rebuilding Boxes—Coolers and Cases  
827 E. Adams St., Springfield, Ill.

Am selecting electric refrigeration equipment for a house starting in a wholesale business.

Will you please connect me with any concern making compressor gaskets or any line of electric refrigeration appliances. JAS. J. KLINE

### Tubing, Controls, Gaskets

Shepherdson Incorporated  
Dealers in Kelvinator Products  
53 Pearl St., Worcester, Mass.

Have you a catalogue listing the refrigerator manufacturers on parts, tubing, controls, gaskets etc.?

ROBERT W. SHEPHERDSON

### New Manufacturer

Todd-Becker Co.  
Wholesale & Retail Druggists  
Sioux City, Iowa

We are putting an ice cream cabinet on the market and would like to have you send us a list of manufacturers who make compressors suitable for this purpose. J. A. TODD, President

**THE  
RED  
BOOK**

**Business News Publishing Co.**

Publishers of Air Conditioning and Refrigeration News

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Advertising Representative: John B. Gallagher Co.—New York and Chicago

**50,000  
COPIES**



# REFRIGERATION NEWS

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## '36 Appliance Sales of Norge Total 533,334

### Sales Increases Shown in Refrigerators, Ranges, Washers & Ironers

DETROIT—Sales of Norge and other Borg-Warner household appliance divisions during 1936 totaled 533,334 units, an increase of 56.5% over 1935, to give Norge the greatest sales year in its history, Howard E. Blood, president of Norge Division and executive vice president, Borg-Warner Corp., announced this week.

The increase reflects gains made by Norge Division in sales of refrigerators, ranges, and ironers; by Detroit Vapor Stove Division in ranges; and by Norge Heating and Conditioning Division in gas and oil fired furnaces, water heaters, and space heaters.

Sales increases for the various Borg-Warner appliance divisions represent gains above general industry advances in many cases, Mr. Blood said. Norge sales increases totaled 41.3% in electric refrigerators, 98.2% in washers, 120.6% in ironers, 96.8% in gas ranges, and 165.9% in electric ranges, compared with those during 1935.

"Recent Norge surveys among nearly 25,000 homes throughout the country indicate a 4.63% interest in new home building and a 16.39% interest in home modernization," said Mr. Blood.

### Hulburd Named to Utility Sales Post at Kelvinator

DETROIT—Appointment of F. G. Hulburd as assistant to the director of utility sales for Kelvinator Corp. has just been announced by H. W. Burritt, vice president in charge of sales.

Mr. Hulburd, who has been connected with the commercial sales division for some time, will assist Campbell Wood, director of utility sales.

### Western Auto Stores Sell G-E in New Orleans

NEW ORLEANS—Appointment of Western Auto Stores as retailers, in three New Orleans outlets, of the complete line of General Electric

(Concluded on Page 10, Column 1)

## Appliance Exhibits Overflow Allotted Space at Marts

CHICAGO — Opening Monday amidst scenes of hasty confusion and ungoverned excitement, the 26th annual national furniture market attracted more than 2,000 registered buyers the first morning to the twin shows at the huge Furniture Mart and Merchandise Mart.

Close to 12,000 buyers are expected to give the new merchandise the once-over during the two weeks of the market.

All exhibitors interviewed declared that buyers are arriving with fat rolls of money in their pockets, and that such spirited negotiations haven't been seen since the late Twenties.

Many manufacturers were unable to complete their exhibits in time for the opening day rush.

At the Furniture Mart the "world's largest showing" of refrigerators, ranges, washing machines, and kitchen equipment, is located on the fifth floor.

Increase in the size and number of major appliance exhibits made it necessary to double the floor space for this division, according to Frank W. Whiting, vice president of the Furniture Mart.

Among the refrigerator exhibitors in this division are Coolerator (ice); Dayton; Frigidaire; Heinz & Munschauer; Landers, Fray & Clark; Norge; Ranney (ice); and Ice Cooling Appliance Corp.

Gibson Electric Refrigerator Corp. is located in Space 1115, Furniture Mart. John L. Stephens, sales pro-

(Concluded on Page 10, Column 3)

## The Air Conditioning Progress Number

With this the "Air Conditioning Progress Number" AIR CONDITIONING AND REFRIGERATION NEWS endeavors to bring its readers "up to date" on the subject by presentation of the latest and most comprehensive sales figures, a forecast of 1937 market possibilities by leading industry executives, a review of the industry's history, discussion of some of the latest technical developments, and stories dealing with successful sales methods in the field.

Starting on page 22 is Part 1 of a comprehensive survey covering data on installations by market classifications in the major population areas of the country.

On page 4, and also on pages 33 and 34, are letters from executives giving views on the market in 1937.

Part 1 of the review of the industry's history starts on page 24.

Reports of successful sales methods used are published in stories on pages 9, 18, 21, 23, and 25.

Also in this issue is the start of a new series of articles, "How to Select and Install Air Conditioning Systems."

## Peerless Changes Corporate Name

CHICAGO—Peerless Ice Machine Co. of this city has changed its name and henceforth the firm will be known as "Peerless of America, Inc."

According to R. W. Kritzer, president of Peerless, it had long been felt that the old name was misleading and unsatisfactory, because of the fact that Peerless no longer manu-

(Concluded on Page 2, Column 1)

## 'Salesmindedness' Is the Key to the Future Progress Of Air Conditioning, Says J. K. Knighton

By J. K. Knighton,  
Manager of Commercial Air Conditioning, Kelvinator Corp., Detroit

IT is usually only once in a lifetime that a new industry arises to take its place among the basic ones that dominate the habits, prosperity and social trends of a nation. The automotive business was one. It changed a world from a horse and buggy era to the present one of brilliant industrialism. It was primarily responsible for making America the world power that it is today. Then came the airplane, reducing distances to mere minutes.

Today the air-conditioning industry and business are well advanced into another period of evolution that will change the habits of our peoples, bring about a new era of habits and elevate still further the already high living standards of the American people. If it does all this, it will have contributed largely to making America still greater and will have earned its place as one of the nation's basic industries.

Conditions unlike these that have met the birth of other industries con-

fronted the air conditioning industry. When the automobile was born scoffers on every side sneered derisively that "the 'tarnal thing won't run." But when air conditioning was formally presented it found instant public acceptance. America had become educated to an acceptance of the unusual. It had become accustomed to "something new."

Air conditioning has advanced rapidly. Much still remains to be done and, from a standpoint of distribution, we are accomplishing this as fast as possible.

The year 1937 will see greater strides made than we have ever been able to accomplish in the past. A careful survey of conditions indicates that there should be an increase of at least a hundred per cent for the industry as a whole. This is a decidedly conservative estimate. As to what Kelvinator will do, I'll say only that I know that Kelvinator will be in a commanding position.

## Kitchen Bureau '36 Estimates of Sales Show Big Gains

NEW YORK CITY—The National Kitchen Modernizing Bureau last week estimated domestic sales of some major electrical appliances, with the percentages of increase over 1935 sales, as follows:

Ranges, 318,000, 48% increase; dishwashers, 14,000, 75% increase; and water heaters, 104,000, 48.5% increase.

## Crosleys Previewed At Closed Sessions

CINCINNATI—One hundred and fifty distributors and their representatives from all parts of the United States previewed the 1937 line of Crosley household electric refrigerators at a closed meeting Tuesday, Jan. 5, in the studios of WLW, Crosley Radio Corp. radio station.

The new models were presented personally by Powell Crosley, Jr., president of the corporation. Sales, merchandising, and advertising plans were outlined by Thomas W. Berger, general sales manager; Glenn H. Corbett, advertising manager; and G. Earle Walker, merchandising manager.

In addition to the presentation of the new Shelvador models, distributors were told of the progress of merchandising the Crosley Xervac, the machine for growing hair. Promotional plans for Crosley Savamald electric washers and ironers also were presented.

## Grunow Stresses 'Economy' in '37 Selling Program

### Cabinet Styling Also Opens Way for 'Beauty' Theme; \$149.50 Is Base Price

CHICAGO — Grunow refrigeration advertising in 1937 will stress economy, and the vacuum-operating unit, rather than safety.

Retail prices on the 1937 Grunow refrigerator line will begin at \$149.50. More than 100 representatives of Grunow distributing organizations heard those two announcements at the pre-showing of Grunow 1937 products held in conjunction with the mid-winter convention of the General Household Utilities Co. in the Stevens hotel Jan. 5 and 6.

Two apprehensions of the industry-at-large were thus lessened at this meeting: (1) That Grunow advertising would continue its "scare" headlines, and its pictures of babies, nurses, stretchers, ambulances, gasping men and women, and gas masks; and (2) that Grunow would follow the introduction last fall of his 11-tube radio for \$49.50 with a sensationally low-priced refrigerator.

Grunow has never been one to "stay put," but at the convention, at least, it was indicated that his prices would continue to be well above those of other manufacturers, and that the new advertising themes

(Concluded on Page 2, Column 2)

## Kelley-How-Thomson Takes on S-W Line

DULUTH, Minn.—The Kelley-How-Thomson Co. of this city, one of the oldest and largest distributors of radios and refrigerators in the northwest, will handle Stewart-Warner products exclusively, according to an announcement just released.

The company will maintain complete sales and service organizations and full stocks of refrigerators at Duluth, St. Paul, and Billings.

L. L. Kelsey, special sales representative for Stewart-Warner com-

(Concluded on Page 10, Column 5)

## Mealey Heads Hotpoint Refrigerator Division

CHICAGO—Harry C. Mealey, a member of the General Electric Co. organization for 18 years, has been appointed to head the Hotpoint refrigeration division of Edison General Electric Appliance Co., according to R. W. Turnbull, vice president and general sales manager.

Mr. Mealey's appointment follows four years' service as manager of Hotpoint refrigerator sales in Cleveland before the line was merged with other Hotpoint major appliances for distribution through Edison General Electric Appliance Co.

## Three-Year Cumulative Record of Electric Refrigerator World Sales, Exports, Retirements and Market Saturation

(See editorial on page 20)	World Sales	Exports	Sales in U.S.	Retirements	Dealer Stocks	Total in Use in U.S.	Wired Homes	Market Saturation
Dec. 31, 1933	5,885,000	356,000	5,529,000	800,000	75,000	4,645,000	19,844,000	23.3%
During 1934	1,390,000	107,000	1,283,000	75,000				
Dec. 31, 1934	7,275,000	463,000	6,812,000	875,000	125,000	5,803,000	20,694,000	28.0%
During 1935	1,688,000	120,000	1,568,000	142,000				
Dec. 31, 1935	8,963,000	583,000	8,380,000	1,017,000	125,000	7,229,000	21,204,000	34.1%
During 1936	2,185,000	185,000	2,000,000	83,000				
Dec. 31, 1936	11,148,000	768,000	10,380,000	1,100,000	200,000	9,071,000	21,888,000	41.4%



## Peerless to Open New Factories in Four Countries

(Concluded from Page 1, Column 3) factories ice machine compressors, but fin coils for cooling and heating, valves, and kindred refrigeration and air-conditioning equipment.

"When adopting a name it is sometimes preferable to take one that is descriptive of the business it represents," explained Mr. Kritzer. "However, a name descriptive of the wide variety of Peerless products would have been cumbersome and unwieldy, and to be truly descriptive would have to embrace both heating and cooling equipment. More important is the fact that the name 'Peerless of America, Inc.' is easy to read, easy to pronounce, easy to remember.

"A third consideration concerned the future adaptability of the name chosen. We believe the new name is broad enough and yet limiting enough in scope to take in any future plant expansion in either the domestic or foreign fields. Peerless products will soon be manufactured in London, Ontario; London, England; Sidney, Australia; and Antwerp, Belgium; and other foreign expansion is proposed.

"However, it is important to note that no change in ownership or management has taken place," said Mr. Kritzer. "The same executives will direct the company under the same policies as in the past."

The name change comes at the beginning of the firm's twenty-fifth anniversary year.

## Deodorizer and Air Circulator Included In Super Deluxe Grunow; New Cabinet Designs Embody Streamline Motif

(Concluded from Page 1, Column 5) would be the "econophase vacuum-operating unit," and "the most beautiful refrigerator in the world."

To back up the latter statement, Grunow is offering a new cabinet styled by George W. Walker of Detroit, which carries the streamline motif furthest yet. Everything is rounded, including top, door, and corners, achieving a result which, were it not for the solid, four-square base, might approach the tear-drop in effect.

Models turned out in the flush-door, rounded-corners-but-flat-top style of the 1936 Grunow line will also be presented in the lower price brackets. These are showing heavier, flashier hardware than heretofore.

Teledial tuning is being featured again in the radio line. Surprise product at the convention was an automobile radio equipped with Teledial. Mr. Walker has also designed some new radio cabinets for Grunow. Farm sets will be given strong play by Grunow distributing organizations this year.

### GRUNOW PRESENTS MODELS

Presentation of models was made by William C. Grunow; merchandising talks were offered by Walter L. Eckhardt, new director of sales. Chief Engineer M. W. Kenney and Dr. J. D. Jordan told the engineering story; and Tod Reed, new advertising manager, outlined the advertising

campaign he is planning in conjunction with Ruthrauff & Ryan.

For Wednesday night a banquet and entertainment was scheduled. Rather than continue with a formal program, most of Wednesday was occupied with individual conferences between distributors and their principals, factory executives, and division representatives. The following officials held "open house" in designated Stevens hotel rooms:

### OPEN HOUSE

Wm. C. Grunow, president; A. G. Messick, vice president; R. R. Trimarco, treasurer; S. L. Arneson, secretary; E. D. Coots, assistant to the president; A. C. Winnan, director of purchasing; Walter L. Eckhardt, general director of sales.

J. J. Davin, sales promotion manager; F. P. Hart, sales order department; Tod Reed, advertising manager; L. A. Passow, advertising department; Ray Shadley, manager of accounts receivable; M. W. Kenney, director of engineering; L. A. Carlson, chief refrigeration engineer.

Lt. Com. Fred H. Schnell, chief short wave radio engineer; Dr. J. D. Jordan, development engineer; G. A. Preston, manager of service, franchise, statistics; W. E. Donley, service and parts; H. W. Faulstich, service and parts; F. H. McCarthy, service and parts; C. Valanta and R. Fredg, special representatives.

Division representatives: H. E. Young, Boston, Portland, Hartford, New England; H. D. Macrae, Reading, Utica, Albany, Rochester, Buffalo,

## Key Specifications of Grunow Line

Model	Capacity (Cu. Ft.)	Shelf Area (Sq. Ft.)	No. of Trays	Ice Cubes	Lbs. of Ice	—Exterior Dimensions—		
						Height	Width	Depth
51W	5.52	11.0	4	105	10.0	53%	24%	24%
61W	6.40	11.1	4	105	10.0	57%	27%	25½
58WD	6.01	10.75	4	105	10.0	56%	26%	27½
63WD	6.80	13.1	4	105	10.0	58%	29%	24%
63WSD	6.89	13.1	4	108	10.1	58%	29%	24%
82WSD	8.74	16.9	4	108	10.1	62%	32%	27½

Binghamton, Philadelphia, Newark; J. P. Miller, Pittsburgh.

R. E. Kane, Toledo, Cleveland, Bluefield, Cincinnati, Clarksburg, Charleston, Huntington; J. J. Davin, Detroit, Indianapolis, Louisville, Saginaw, Grand Rapids, South Bend, and Paducah; J. A. Laughran, Milwaukee, Davenport, Dubuque, Des Moines, Sioux City, St. Paul, Duluth; W. C. Hutchings, St. Louis, Kansas City, Omaha, Wichita, North Platte; V. P. Finger, New Orleans and Memphis.

H. C. Abbott, Little Rock, Oklahoma City, Fort Worth, Houston, San Antonio; P. W. Peck and S. W. Peck, Winston Salem, Miami, Birmingham, Jacksonville, Charleston, Nashville, Atlanta, Americus; W. E. Darden, Portland, Seattle, Spokane, San Francisco, Boise, Denver, Salt Lake City.

J. M. Spain, El Paso, Los Angeles; H. A. Smith, Metropolitan New York; J. Newark, Metropolitan New York; W. J. Collins, Chicago; S. A. Silliman, Baltimore, Washington, Petersburg.

### 'AERATOR' DEODORIZER

Prime new exclusive Grunow feature this year is the "Aerator," a deodorizer and air circulator which is included with super deluxe models only. It is placed in the upper right hand corner of the cabinet and is comprised of a small suction pump that draws up the air, and then passes it over a carbon cartridge to eliminate all odors. Impure air is exhausted out between the lining and the cabinet shell.

Refinements in the refrigerating mechanism include a new compressor rotor which is smaller and has less weight, thereby reducing cost of operation, it is claimed. The single-pass style of condenser has been retained, but has been considerably enlarged. A new automatic overload trip acts as an emergency shut-off to protect the unit from overheating, and automatically sets the unit in operation again to maintain a constant temperature in the box.

All evaporators now provide for a minimum of 108 ice cubes, or 10 lbs. of ice at a freezing, with fast freezing claimed in all ice tray positions. Tray releases are standard on all models. There is also space for frozen storage in the ice compartment.

All models have the 11-point temperature control, which is mounted on a chromium plate over the evaporator.

### DIAL THERMOMETER

Grunow, too, has a temperature indicator this year, but it has its own unusual style. It consists of a dial on the order of a meter or speedometer and stands on the back wall of the cabinet near the top left-hand corner.

Grunow's 1937 refrigerator line of six models is divided into three series. In the standard series is the "51W" model with 5.1 net cu. ft. capacity and the "61W" model with 5.75 net cu. ft. capacity. Deluxe series models include the "58WD" model with 5.2 net cu. ft., and the "63WD" with 6.4 cu. ft. capacity. Top series is the super deluxe, which includes "63WSD" with 6.4 net cu. ft. capacity, and Model "82WSD" rated at 8.1 net cu. ft.

### CABINET STYLING

Cabinet styles for the several models vary, and are not consistent as to series. Standard models have a style that is somewhat new, with rounded corners and offset door. Model "58WD" follows the style of the past year, and Models "63WD" and "63WSD" are in the new design by Mr. Walker, while model "82WSD" follows the lines and flush door style of the past year, with minor refinements.

All models have needle bar shelves, interior electric light, two round left-over dishes, water bottle, and a covered vegetable pan. Deluxe and super deluxe models have sliding shelves, and the super deluxe models also have one rubber ice cube tray. The largest model in the line is equipped with a foot pedal door opener.

The thermometer is included with deluxe and super deluxe models only. Super deluxe models also have an oval leftovers dish, fruit rack, and a sliding vegetable drawer.

In the Grunow 1937 radios the "Violin-Shaped" cabinet design, which is claimed to produce "purer" tones, will be emphasized, along with "Teledial" tuning. The Grunow "Eleven" at \$69.95 and the Grunow "Twelve" will be the two models most actively promoted.

### NEW AUTO RADIO

Shown at the convention was a Grunow auto radio with "Teledial" tuning. Claimed for the auto radios this year are elimination of tinny shrillness in high notes and hollow booming in the lower octaves through the hi-lo compensation feature. Also claimed is the elimination of power howls, and "fading."

There are three models in the auto radio line—a 6-tube model, a 6-tube model without speaker in set, and a "super-six" with greater sensitivity and selectivity.

A "premium" offer of a "Wincharger" at one-third its list price is a feature of the plan to market the battery set farm radio line. The "Wincharger" serves to charge the batteries, and will work in almost any kind of a breeze, it is claimed.

Models in the "farm set" line include 6-volt 4-tube, and 2-volt 5-tube table sets, and 6-volt 4-tube and 7-tube all-wave console models.

That General Household Utilities Co. is putting considerable import on the value of local dealer advertising is indicated in its offer to stand two-thirds of the cost of such advertising to those dealers who do any volume of business at all. The offer, as outlined to distributors at the convention is as follows:

### ADVERTISING OFFER

"Upon receipt from you of suitable evidence of advertising, together with copies of paid invoices from your distributor as evidence of your Grunow refrigerator purchases, we will remit through your distributor our share of such advertising you do in accordance with the following schedule:

Units Bought From Distributor	Total Advertising Budget	Dealer Share	Factory Share
Less than 10	\$ 0	\$ 0	\$ 0
10 to 19	60.00	20.00	40.00
20 to 29	150.00	50.00	100.00
30 to 39	350.00	116.67	213.33
40 to 49	500.00	166.67	333.33

"Should the dealer purchase in excess of the number of refrigerators called for by this agreement, in multiples of 10, an additional allowance will be made corresponding in amount as set forth above.

### OTHER PROVISIONS

"Provisions applying to this agreement are as follows:

"1. Evidence of newspaper advertising shall consist of publisher paid invoice together with tear sheets. Evidence of radio broadcasting is to consist of certificate of radio station together with their paid invoice. Evidence of billboard posting to consist of certificate of posting, showing location and copies of posting company's paid invoice.

"2. Only advertising in newspapers, radio broadcasting, or billboards is hereby authorized.

"3. Newspaper advertising shall be used only in connection with our prepared ads. Billboards shall be used only with our prepared 'paper.' Radio shall be used only in connection with electrical transcriptions supplied by us.

"4. Dealers lowest contract rates are to apply in all media."

# ALCO Dependability

Assured by

## Precision Manufacturing

● The efficiency and continuous operation of a refrigeration or air conditioning installation depends largely upon the reliability and accuracy of the valve controlling the expansion of refrigerant.

To insure the utmost in dependability, the most advanced methods of precision manufacturing are used throughout the construction of Alco valves. This precision in manufacturing, careful inspection and repeated testing, backed by years of sound refrigeration and engineering knowledge, have made Alco valves a standard

of dependability—known wherever refrigerants are controlled. Alco Series "T" Thermo Valves are available in a wide variety of capacity sizes, applicable to any type of low side evaporator. Consult Alco engineers on your next air conditioning or refrigeration problem—their field and laboratory services are gladly offered without obligation.

Write for Bulletin No. 144-A



ALCO VALVE CO., INC.

2628 Big Bend Road, ST. LOUIS, MO., U. S. A.

THERE IS AN ALCO SUPPLY HOUSE NEAR YOU



TYPE TIL



TYPE THL

## Coming — TWO NEW LARGE CAPACITY ALCO THERMO VALVES for CH<sub>3</sub>Cl and F-12 Types TIL - THL

**Large Capacity—**  
45 to 116 Tons CH<sub>3</sub>Cl  
26 to 61 Tons F-12

**Small Dimensions—**  
6-7/8" x 5-1/16"

**Light Weight—**  
3-1/4 Pounds

**Simple Design—**  
Only 3 Major Parts

**Accurate Control—**  
No load to full load without flooding

**Rugged Construction—**  
As strong as the strongest part of the system

Thermo Valves—Constant Pressure Expansion Valves—High Pressure Float Valve—Low Pressure Float Switch—Magnetic Stop Valve.

For the automatic control of all usual refrigerants



WOULD YOU PREFER

**to sell or**

**sell against**

THIS REFRIGERATOR

IN 1937!

**FACT ONE:**

The new Kelvinator is Plus-Powered. It has as much as double the cooling capacity of other well-known refrigerators of equal size.



**FACT TWO:**

The new Kelvinator runs only half as many minutes per day—during the rest of the time it maintains low temperatures using no current at all.

*And the program that goes with it  
is as different as the product*



## Air Conditioning Has Arrived But We Have a Big Educational Job to Do

Says A. E. Allen, Vice-President,  
Westinghouse Electric & Mfg. Co.,  
Mansfield, Ohio

Before attempting a review and forecast of the air-conditioning industry, in answer to the request of AIR CONDITIONING AND REFRIGERATION NEWS, I'd like to explain that any reference I make to this industry, I shall consider it as an industry already "arrived." For years we have been talking and dreaming about the time when this industry would grow out of its swaddling clothes into manhood, and have made many fond and fanciful conjectures as to how we would spend our profits when that day came.

After examining our own records, and giving some careful study to the overall industry picture, I cannot help but believe that our "baby" has actually grown up,—and that we've become so familiar with its childish problems, that we haven't recognized its rights as a young man. In other words, gentlemen, the air-conditioning industry is out of the pioneering stage, and we must consider it as having taken its rightful place among businesses demanding full-time and expert attention. Instead of talking

about what we're going to do when it "arrives," I'm of the opinion that it has become of age, rather unobtrusively, to be sure, and we'd better feed, clothe, and shelter it well.

One of the first reasons on which I base this opinion is that this air-conditioning industry is just about at the same stage in its development as were the industrial refrigeration machinery business, the passenger automobile industry, and the household electric refrigeration industry when they lifted themselves out of

the pioneering period into the "mass" production or the public acceptance climb.

It took about 10 years for the first "break" to come in the sales of each of the industries units I have cited. During that 10-year period these businesses, notably the automobile business, went through painful periods of doubt, trouble, small discounts, and every other discouraging factor that distribution faces. And the air-conditioning industry has just passed through approximately the same history,—with the results that a close study of the sales charts of all these businesses I've mentioned show a similarity.

Another factor that would tend to strengthen my belief that the air-conditioning business has grown up is—approximately \$70,000,000. Seventy million dollars, even these days, when ciphers are added with such readiness, is still a lot of money, and any industry that stimulates that much money in 10 months is grown up to me. From the best source I have, I find that from January to October inclusive, 1936, about \$35,000,000 worth of orders was booked by the leading manufacturers, and approximately that much more was spent by the industry or allied interests in installing and purchase of other necessary equipment to make an installation.

I am also of the opinion that at the rate the industry is going, 1937 will see about a 25% increase in dollar volume and activity. At least, we're building our organization to handle that much of an increase, and I'm sure other manufacturers are expecting a healthy increase also.

Assuming the total increase for all

## Lack of Trained Man Power Is the Bottle Neck of the Air Conditioning Business

Says J. J. Donovan, Manager,  
Air Conditioning Department,  
General Electric Co., Bloomfield, N.J.

We are planning on a very substantial increase in our air-conditioning business for 1937. Our expectations for increased business are based on several factors as follows:

1. Improved business conditions.
2. Demonstrated proof of the economic benefits of air conditioning in commercial installations such as restaurants, shops, theaters, etc.
3. Increased willingness on the part of industrial executives to approve expenditures for plant improvements.
4. An increase in the number of trained sales engineers available who are properly qualified to present air-conditioning propositions to prospective purchasers.

This last factor, in my opinion, is most significant, because the bottle neck of the industry has been, and still is, the question of trained man power.

divisions of air-conditioning equipment to be as above stated, from our estimates it appears that complete systems will show about 45% of that increase; room-type unit conditioners, 5%; room coolers about 25%, and winter conditioning systems the remaining 15% of the increase.

Along with other developments, I believe we will see this year, a great deal more activity or a trend toward the "packaged" unit. As an indication of this trend, Westinghouse recently announced a new room cooler in New York and it has received more than the customary amount of favorable attention. We feel that the industry is going to have to consider the packaged unit as an important item in the future.

Of course, in considering this industry, one must consider the distribution system, and it is a well-known fact that here is the "neck of the bottle." The industry hasn't really decided yet just who is the man to run with the ball. And until we decide on our ball carrier, we're going to have a lot of interference

standing around, all anxious to help, but "nowhere" to go. I do think you will find, however, that the air-conditioning engineer is going to be just about the most valuable type of salesman for the industry to develop, since he can talk sales more convincingly, due to his knowledge of equipment and installation problems.

We still have a tremendous educational job to do, and the sooner we realize it and accept it as such, the quicker we will develop our market. The industry must hold schools, the manufacturer must hold schools, and the distributor must hold schools. And advertising must be used to educate the consumer. All must be tied into a comprehensive program to tell the story of air conditioning to distributor, salesman, and public.

Air conditioning is a grown boy now, and we've got the problem of his education and general "upbringing" with us. I'm happy to say, though, he's a fine, substantial lad with tremendous possibilities and potentialities. Let's treat him as a man.

## Two Types of Salesmen Needed

Says J. K. Knighton

(Concluded from Page 1, Column 4) come bracket. Today we are selling a package unit in the sense that we provide all parts and equipment necessary, leaving little for the distributor or dealer to acquire outside.

Selling of air-conditioning equipment is another important factor that enters into the situation. Selling air conditioning requires a distinct type of man.

I might say that it requires two types of men—one to sell commercial air conditioning and another to sell equipment for the home. The type of salesman to sell air conditioning for the use of commercial establishments must be of the factual type. The man to sell air conditioning to the home owner must be of the imaginative type.

These two men have two distinct messages to tell. The man selling to the home must be able to show the advantages from a physical standpoint. He must be able to paint the discomfort of the summer so vividly that the prospect will become interested at once. Against this he must contrast the comfort that goes with air conditioning.

The man selling to the beauty parlor, hotel, store, etc. must be able to show the commercial advantages in dollars and cents. He must show how air conditioning will pay for itself.

The commercial air-conditioning salesmen must know something of engineering, but above all, he must be a salesman. He must be sales minded, with enough of engineering to have a basic understanding of the subject.

Another thing that distributors and dealers handling air conditioning must bear in mind, is that the salesman must be well paid. It is better to have two good salesmen than half a dozen mediocre ones. Therefore, it

is good business all around to pay well and keep good men employed.

Existing businesses with an eye to expansion will find ample opportunity in the air conditioning field providing they have, or stand ready to meet the particular qualifications for this business. These qualifications may at first seem rigid, but, to one really desiring to be in this business they are entirely reasonable.

Naturally, an existing business, with the qualifications of integrity, financial stability and local prestige will be more acceptable to the manufacturer than a new group of men coming into the field and requiring capital to finance their entire undertaking.

The specific qualifications for this business, in addition to the above, are: engineering ability, installation and service facilities. The latter may have been obtained through experience in the handling of major commercial refrigeration installations or other allied fields. In addition to all of the above there remains, of course, the ability to direct an outside sales force which can be obtained only through actual experience.

Beyond question air conditioning has arrived. For a long time we have had public acceptance of the idea from a standpoint of personal comfort for the individual and as a means of attracting new business for the merchant. Within the past few months a significant change has been noted. No longer public acceptance is confined to the idea alone, it now embraces product and price as well. This, in effect, increases the responsibility of the manufacturer and makes 1937 the ideal time for those interested in the distribution of air conditioning to become identified with this new business that has untold possibilities.



The position of undisputed leadership, held by Henry Products in the Air Conditioning and Refrigeration Industries, is the result of three policies, simple in statement but far-reaching in results. Of first importance with this company is correct engineering. Year after year, Henry products have demonstrated their superiority in a highly competitive field. Innovations in design have resulted in greater operating efficiency and service convenience. Secondly—completeness of line. Henry today makes the most complete line of Strainers, Dryers and large Valves. And third—Complete Jobber Distribution. Henry Products are stocked and recommended by every important jobber in the country. Follow Henry and you follow the leader.

HENRY VALVE COMPANY, 1001-19 NORTH  
SPAULDING AVE., CHICAGO, ILLINOIS, U. S. A.

# HENRY

DRYERS • STRAINERS • FREON LINE VALVES • SERVICE TOOLS



Features? Yes,  
plenty of them!  
But something  
greater  
than them all  
sells this  
1937  
**COPELAND!**



Visit the Copeland Show Headquarters, Suite 422-A,  
Stevens Hotel, Chicago—January 10 to 16, 1937

**T**ake this tip! Before you decide upon your 1937 refrigerator sales arrangements, investigate Copeland!

You'll find a great new driving power behind Copeland's rapid progress these eventful days.

You'll find a new and *complete* line of the finest refrigerators ever engineered and built by Copeland—and that's saying *everything*, for Copeland is the industry's pioneer.

You'll find in the product itself some-

thing far more "sure-fire" as a sales-closer than any list of features—something that, during 1937, will provide Copeland and you with the most outstanding and most powerful advertising and selling story that the industry has seen in many years.

Take the first step toward easier and greater profits today by writing, wiring or phoning J. D. McLeod, General Sales Manager, Copeland Refrigeration Corporation, Detroit, Mich.

# COPELAND

## REFRIGERATION CORPORATION

DALLAS E. WINSLOW, President

DETROIT, MICHIGAN

PIONEER MANUFACTURERS OF REFRIGERATION



## NRDGA Planning Forum on Housing At Convention

NEW YORK CITY—With its own estimate that half a million new homes will be built in the United States during 1937, the Housing committee of the National Retail Dry Goods Association will hold a housing forum in connection with the Association's 26th annual convention at the Hotel Pennsylvania here Jan. 18-22.

Two-fold purpose of the forum, according to Saul Cohn, chairman of the housing committee, will be to demonstrate new developments in housing and home furnishings, and to provide some 5,000 merchants and store executives attending the convention, with information how stores may tie-in merchandising and promotion with the housing expansion and home remodeling movement.

Store representatives will discuss sales potentialities in home furnishings and equipment which the housing movement offers. They will consider the possibilities of department store merchandising of air conditioning, automatic heating equipment, prefabricated houses, and similar heavy equipment.

Other topics which department store heads will discuss include advantages of establishing a department store bureau to supply customers with information on home building, furnishing, and decorating; how they may tie-in with builders to stimulate home furnishing sales; and the feasibility of establishing a central bureau to disseminate information on home building in each community.

Home ownership, and methods for home building financing will be discussed by FHA officials and executives of representative consumer organizations of the forum, according to tentative plans made by the housing committee. Speakers will outline the possibilities of reducing home building costs by standardizing building materials by manufacturing them on a greater mass production scale.

The FHA "Model Town," a complete community planned in accordance with the most advanced ideas on town planning, will be exhibited for the first time in New York City at the NRDGA convention.

## Prefabricated Home Is Visualized by Industrial Paper

PITTSBURGH — Although claims made today for the prefabricated house may be extreme, the idea of a mass production house, quickly erected and low in cost, is sound according to an article published in the Aluminum News-Letter, a publication issued here by the Aluminum Co. of America.

"Where the objective is right, the architects and engineers will eventually find a solution to the technical problems, and others will solve the problems of marketing and financing," the article says.

Forerunner of the prefabricated house, the Aluminum News-Letter believes, was the 150-lb. portable aluminum house, called the Klondike Home, offered for sale by Arthur F. Howes in 1898.

"The house was a crude affair with windows of 'indestructible celluloid,' and its one room was six by seven feet," the article continues. It was presented in a complete package—house, stove, cooking utensils, and bed were shipped to the buyer in three light parcels.

"Tomorrow's prefabricated house may emerge as a semi-portable unit that can be knocked down and reassembled whenever the owner desires to move to another community," the article states.

## Canadian Co. Starts Case Manufacture

BRANTFORD, Ont., Canada—Ruddy Freeborn Ltd., a new concern devoted to the manufacture of refrigerator cases, has been organized here with the following officers: president, E. T. Sterne; manager, W. T. Freeborn; secretary-treasurer, Fred Mann; superintendent, J. W. Freeborn.

Directors of the firm include Mr. Sterne, Mr. Mann, Fred Ritchie, and J. C. Trepanier.

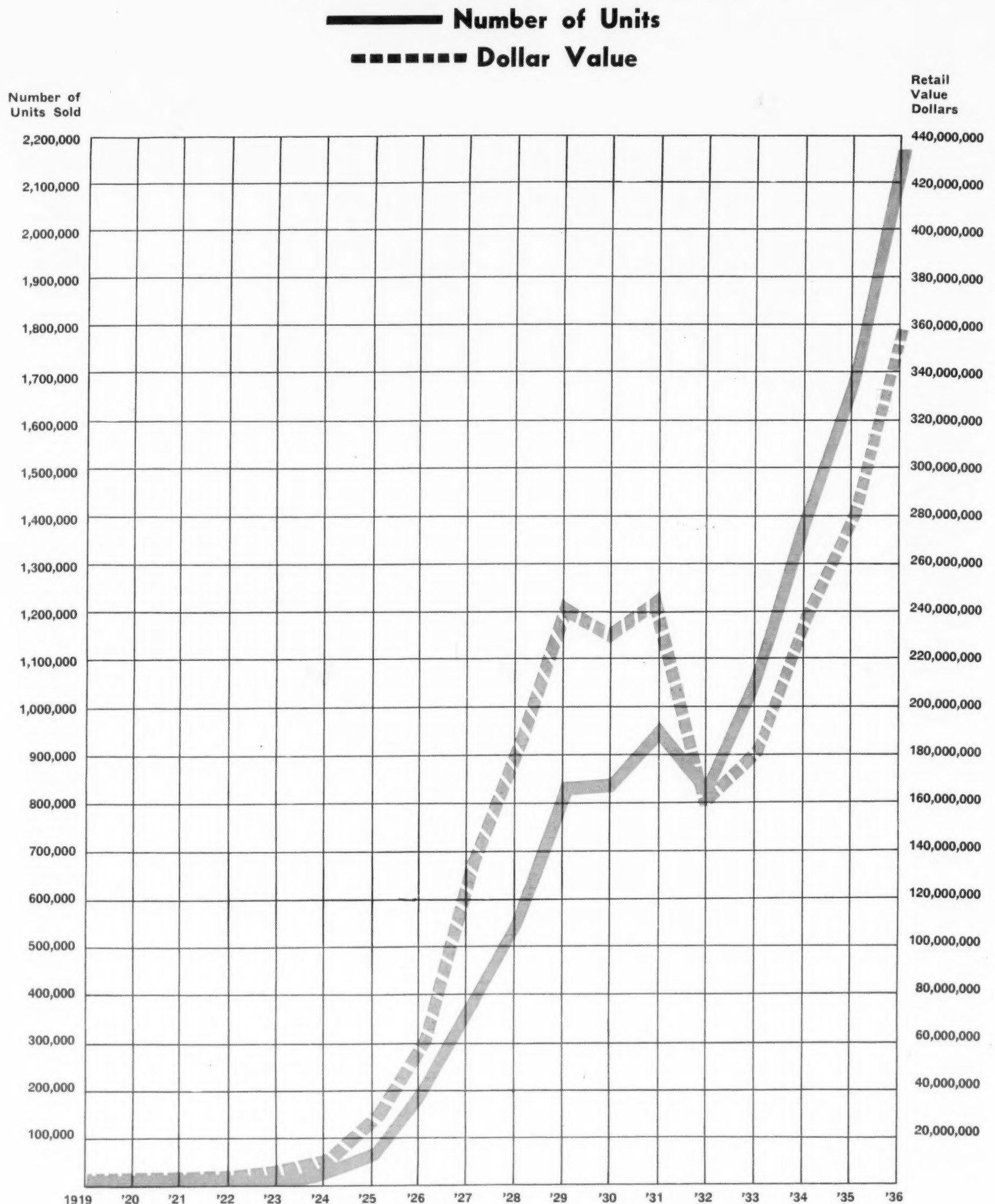
## General Electric Plans \$200,000 Building in Houston

HOUSTON, Tex.—General Electric Co. has completed plans for immediate erection of a new \$200,000 building here. Constructed of brick and steel, the 2-story building will house the offices, warehouses, and service shops of G-E, General Electric Supply Corp., and General Electric X-Ray Corp.

Over 7,000 sq. ft. of land adjoining the building will be used for truckage purposes.

# STILL GOING UP!

## Seventeen Year Record of World Sales Of Household Electric Refrigerators



Copyrighted 1937 by Air Conditioning and Refrigeration News, Detroit, Mich.

Year	No. of Units	Average Price	Retail Value	Year	No. of Units	Average Price	Retail Value
To 1920	10,000	\$600	\$ 6,000,000	1929	840,000	292	\$ 245,280,000
1921	5,000	550	2,750,000	1930	850,000	275	233,750,000
1922	12,000	525	6,300,000	1931	965,000	258	248,970,000
1923	18,000	475	8,550,000	1932	840,000	195	163,800,000
1924	30,000	450	13,500,000	1933	1,080,000	170	183,600,000
1925	75,000	425	31,875,000	1934	1,390,000	172	239,080,000
1926	210,000	390	81,900,000	1935	1,688,000	166	280,208,000
1927	390,000	350	136,500,000	1936	2,185,000	164	358,340,000
1928	560,000	334	187,040,000	Total	11,148,000	...	\$2,427,443,000



# FULL SPEED AHEAD



## FRIGIDAIRE ADDS **MORE POWER!**

**SETS A FASTER PACE FOR 1937** . . . It's full speed ahead as Frigidaire—already traveling faster than ever—greet the new year and the opportunities ahead with added power! With a new selling strategy! With an enlarged schedule of packed-with-punch advertising—more dramatic and sales-compelling than ever! With a new product that incorporates many startling new features—including *one* that adds *so much* to the services of refrigeration that it will instantly capture the imagination of the buying public and start dealers talking from coast to coast! • Frigidaire Dealers in 1937 will have the most powerful program they have ever had. And be prepared for another record-breaking year! • Soon everyone will know the news. And Frigidaire men will be on their way to even greater success and profits!

FRIGIDAIRE DIVISION  
General Motors Sales Corporation • Dayton, Ohio



**YOU'LL DO STILL BETTER WITH FRIGIDAIRE IN '37!**



## Bureau of Standards Authority Explains Needs and Standards In Conditioning Paper Stock

NEW YORK CITY—Air-conditioning requirements of multicolor offset printing, and standards for conditioning paper used for printing work to the proper hygrometric condition, were outlined by C. G. Weber of the U. S. Bureau of Standards, before the American Society of Refrigerating Engineers at their annual meeting here last month.

"The air-conditioning requirements of modern multicolor offset printing," said Mr. Weber, "are in some respects peculiar to that process and are rather difficult to satisfy. It is necessary to control the atmospheric conditions, not only for the prevention of distortion such as curling, waving, and buckling of the paper, but to keep the dimensions of the sheets constant during printing that requires from two to 20 trips through the press.

### SPECIAL TREATMENT NEEDED

"Distortion of paper can be prevented by conditioning it to equilibrium with the room atmosphere and keeping that atmosphere constant, but that alone will not prevent expansion during printing. Special conditioning treatment is required to avoid the addition of moisture from the press."

Mr. Weber explained that paper is a highly hygroscopic substance having a comparatively high coefficient of linear expansion per unit of change of moisture content. Cellulose fibers, the principal components of paper,

adjust their moisture contents rapidly in response to variations in relative humidity of the surrounding air, and changes in dimensions of the paper result from the effects of variations in moisture content on the swelling of the individual fibers.

There is a straight-line relationship between moisture content and dimensions of paper, said Mr. Weber. Hence, all variations of moisture content are accompanied by corresponding expansion or contraction of the paper. The moisture content of paper in equilibrium may vary by more than 1%, depending on the history of conditioning. This is the most important factor to be considered in preparing paper so that its dimensions will remain constant during the printing of two or more colors, said Mr. Weber.

### SHEET DIMENSION CHANGES AND REGISTER

In multicolor printing by the offset process, the different colors are usually printed on the paper separately, which means that the paper must make a separate trip through the press for each color. Quality printing requires that successive color prints must all register with the first color printed, to within about five thousandths of an inch. Failure of the successive colors to register properly means inferior quality of product and loss of production.

Modern offset presses are high-speed, precision machines, with mechanical accuracy capable of repeating impressions with variations of less than one thousandth of an inch, and the principal cause of failure to obtain register in printing may be attributed to changes in the dimensions of the paper during or after printing the first color.

### MOISTURE RUINS REGISTER

"Practically all changes in dimensions of paper which affect register are caused by variations in moisture content," said Mr. Weber. "Hence, satisfactory results with respect to the register of color prints are dependent on control that will keep the hygrometric condition of the paper constant to prevent expansion or contraction."

"This is somewhat complicated by the fact that moisture from the ink and the wet blanket on the press is picked up by the paper on each trip through the press. Unless the paper is prepared in such a manner that it will not hold this press moisture, expansion difficulties will be encountered."

"It has been found that paper

## Carrier 11-Months Profit Totals \$463,675

NEWARK—An 11-months' net profit during 1936 of \$463,675.96, compared with an operating loss of \$584,745.83 for the whole of 1935, was reported to stockholders of Carrier Corp. last week by L. R. Boulware, general manager of the company.

The 11 months' net profit is after deduction of \$248,189.51 for depreciation, and a provision of \$77,538.51 for Federal income tax.

\$250,000 was paid on the \$1,000,000 bank loans last June. One-third of the remaining \$750,000 is due at the close of each of the years 1937, 1938, and 1939. The next installment will be paid as early as possible in 1937, without weakening the working capital.

The cash balance as of Nov. 30 was \$1,150,363.77 as compared with \$456,609.26 at the beginning of the year.

No dividend will be paid in 1936, but in view of the loans and the provision of the loan contract with the banks, the company will be exempt

from the undistributed profits' tax.

Shipments and closed jobs, on which profit has been taken, increased a little less than 16% for the 11 months' period over the same period last year. This increase was administered with \$217,984 less overhead than was the lesser volume in the same period of 1935.

Sales booked during the period represented a somewhat higher percentage than the jobs closed out, as was indicated by an approximate \$466,000 increase in uncompleted work since the first of the year.

The substantial increase in sales volume in October and November came largely as a result of customers placing this fall the business they would normally have waited to do after the first of the year, Mr. Boulware's report stated. This was in order to be assured of having their equipment ready for operation earlier in the season than has been possible heretofore with late buying, he added.

conditioned to hygrometric equilibrium with the pressroom air, and then printed under constant atmospheric humidity and temperature, normally increases its moisture content during the printing of the first three to five colors, and as a result, expands to cause misregister.

"Results of experimental printings made under controlled conditions have shown that the absorbed moisture comes from the press, and that if increase in moisture content during printing is to be avoided, the paper must be especially conditioned."

### HYGROMETRIC REACTION OF PAPER DURING PRINTING

"Offset papers that are conditioned to equilibrium with the air in a print shop are normally near the lower limit of equilibrium moisture content. This is because they are commonly dried to less than 5% moisture to permit calendaring in manufacture."

"Hence, conditioning to equilibrium with the atmosphere in the ordinary print shop is by absorption because the relative humidity generally maintained in shops with humidity control corresponds to about 5% moisture in the conditioned paper."

"Since the moisture content at equilibrium is below the maximum or desorption curve, it is possible for the paper to hold more moisture and still be in equilibrium. Apparently this is exactly what happens when papers in this condition are printed."

"Papers not in equilibrium with the pressroom air at the start of a printing reach equilibrium after 5 or 6 colors have been printed, which indicates that the exposure during printing is sufficient to adjust the moisture content slowly to a constant amount. Thus, if papers not in equilibrium at the start will reach equilibrium with the surrounding air as a result of the exposure during printing, it is obvious that papers in equilibrium at the start should remain so."

### ATTAINING EQUILIBRIUM

"This has been found to be the case; however, it is evident and has been founded by printing tests, that this equilibrium does not correspond to a definite moisture content."

"If the paper is below the condition of maximum moisture content at the start, the moisture content will increase during printing while the paper remains in equilibrium. This is due to the manner in which the press moisture is picked up and held. All increases in moisture content are accompanied by expansion, and therefore affect the register of prints."

"Papers conditioned to equilibrium with the pressroom air by absorption, then printed in five colors or more, usually gain 0.5% of moisture and remain in equilibrium with the same atmospheric humidity. It is essential that this increase in moisture content during printing be avoided to prevent register difficulties. Two methods of avoiding it have been found to be successful and both require special conditioning of the paper in preparation for printing."

### DOUBLE CONDITIONING

"One method is to adjust the hygrometric condition of the paper so as to place it on the upper or desorption curve, in which condition it cannot absorb additional moisture and remain in equilibrium. This may be accomplished by preconditioning in an atmosphere of high relative humidity, then conditioning by desorption to equilibrium with the pressroom air. This method, while very successful in obtaining the desired end, is not recommended because it

requires conditioning the paper twice under widely different atmospheric humidities."

"A second method, and one used very successfully in commercial-scale printing of nine to 24 colors requiring very close register, consists in raising the initial moisture content by desorption above equilibrium with the pressroom air by 0.5%. This provides an excess to be lost to the air during printing to compensate for the press moisture picked up and held."

"It is accomplished in the print shop by conditioning the originally drier paper to equilibrium with a relative humidity 6 to 8% above that of the pressroom. It requires conditioning in a room separate from the pressroom and under independent humidity control, but requires conditioning the paper only once."

It is now possible for some manufacturers to furnish offset papers with any specified moisture content. This is an excellent practice that greatly facilitates conditioning, believes Mr. Weber, and if carefully done, will eliminate the necessity of conditioning much of the paper used.

### OPTIMUM CONDITIONS

However, he said, means of conditioning paper to the correct hygrometric condition should always be available. For completely satisfactory results in printing, an air conditioning installation for a multicolor offset shop must provide means of raising the moisture content of paper high enough. It is better to start with a higher moisture content than a lower one. The optimum hygrometric condition can be obtained by conditioning the paper in a room in which the relative humidity is maintained 6 to 8% above that of the pressroom.

"Since no other method of properly conditioning the paper has been developed," said Mr. Weber, "an air-conditioning installation should permit maintaining higher humidity in the paper-conditioning room than in the pressroom."

"For central control plants utilizing refrigeration for dehumidifying with a dewpoint control system, the desired difference in humidity can be obtained by maintaining a lower temperature in the paper-conditioned room than in the pressroom."

"Thus, air leaving the spray chamber at a dew-point temperature that will give 45% relative humidity when heated to 75° F. for the pressroom, will be at about 52% relative humidity if heated to only 70° F. for the paper-conditioning room."

### ADEQUATE MACHINE NEEDED

"There appears to be real need for a conditioning machine that will condition paper to any desired moisture content independent of the atmosphere of the room."

"It is believed that this could be accomplished by modifying the ordinary type of paper conditioning machine. It would be necessary to inclose the entire machine so as to recirculate the enclosed air instead of circulating room air, and to provide for the addition of moisture to the air by means of sprays under control."

"The selection of a relative humidity for an offset pressroom should be influenced by a number of factors. The accumulation of static electric charges is greatest when the relative humidity is lowest, and at 45% or above, static difficulties are seldom encountered."

"It is difficult for many manufacturers to furnish paper with moisture content high enough to facilitate paper conditioning if the humidity is maintained much above 45%."

## "THESE NEW OILS separate faster"



HERE'S improved plant efficiency for you. Separation of the oil from refrigerants is more easily effected . . . more complete. Less frequent cleaning of expansion lines or coils is necessary. Heat transfer is more rapid.

These decided benefits are possible because Texaco Capella Oils have a lower pour point and are completely freed from moisture and all sludge forming elements.

You will get greatly improved operation in your refrigerating machinery.

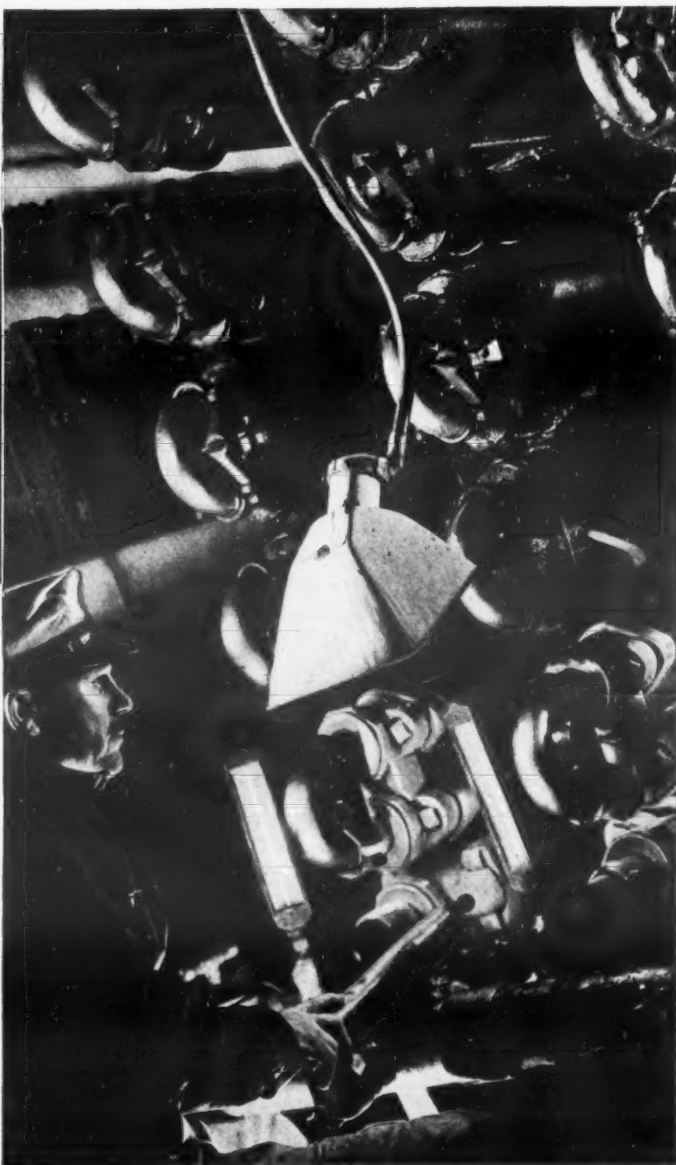
A Texaco representative will be glad to provide practical engineering service to prove the economies of these new Capella Oils.

THE TEXAS COMPANY  
135 East 42nd Street • New York City

Nation-wide distribution facilities  
assure prompt delivery



**TEXACO**  
Industrial  
Lubricants



"We've had cleaner coils—better heat transfer since we put in these Texaco Capella Oils."



## English Servel Distributor Exhibits Conditioners At Architect's & Builder's Exposition

LONDON, England—Utilities, Ltd., English distributor of Servel air-conditioning equipment, featured an elaborate display of air conditioning products at the recent Architect's and Builder's Exposition here.

Enlarged photographs of the Servel factory, views of prominent installa-

tions, and attractive signs formed the background for the actual product display, which included suspended and floor type conditioners, together with machine units.

Promotional literature was distributed by Servel salesmen, to obtain prospects for future installations.

## Memphis Air-Conditioning Distributor Has as Many Installations to Make In Fall as in Summer

By T. T. Quinn

MEMPHIS, Tenn.—"Do you like it in November as you did in May?"

If you're asking about air conditioning, the answer of John M. McGregor, president of McGregor's Inc., Frigidaire and Delco-Frigidaire distributor here, will be an emphatic "Yes!"

For the McGregor air-conditioning division was figuring on as many installations last fall as it did in the spring. Most of them were sizeable jobs, too—hotel rooms, restaurants, apartment buildings—all designed to be ready for use in the 1937 cooling season.

One of the largest installations, a 15-hp. system, was completed during November in the coffee shop of the Gayoso hotel in Memphis, and will not be put into use until next summer. This, to Mr. McGregor's way of thinking, is proof enough that air conditioning is a year-round business, if you go out after it.

The company, in addition to Frigidaire household, commercial, and air conditioning, also distributes Easy washers, Alemite, and RCA radios in western Tennessee, Arkansas, southwestern Kentucky, and northern Mississippi. At present there are 137 domestic, 33 commercial, and 14 air-conditioning dealers in the territory—but Mr. McGregor expects to have that last figure up to 20 by the time the summer of 1937 rolls around.

### REGULAR DEALERS

And here's an interesting note—of the 14 air-conditioning dealerships, all but one have been, and are now, regular Frigidaire household and commercial outlets. The other dealer, a heating contractor, has the Delco-Frigidaire franchise for heating equipment only.

Contacting dealers is a headquarters staff of six field men, schooled in household, commercial, and air conditioning, and supervised by sales manager for each division. A. W. Shelby handles air conditioning; Lem Barlow, commercial; and Herbert Hobbs, household refrigeration sales. Working together, this organization was responsible for the sale of more than \$1,500,000 worth of Frigidaire products during the first 10 months of last year.

One of the largest installations made last year was sold by the Himstedt Plumbing and Heating Co., Frigidaire dealer at Little Rock, Ark. The system, of 40-hp. capacity, and using 100% fresh air, was installed in the McGehee hotel, and conditioned the hotel coffee shop, barber shop, and beauty parlor. The sale was made by Hickey Himstedt, head of the company, which also has the franchise for Frigidaire domestic and commercial equipment.

### 1936 SALES DOUBLE

Sales of air-conditioning equipment during 1936 more than doubled the company's 1935 business, Mr. McGregor says, and he expects 1937 to show as great an increase over last year. And a large percentage of this year's business will be in sales of room coolers.

The reasons? "First, prices are lower than formerly; second, and most important, salesmen are learning to sell room coolers without using complicated engineering terms which neither they nor the customer understand."

"We've got away from talking about 'self-contained air-conditioning units,'" Mr. McGregor says. "Instead, we refer to our 'room coolers.' Also, we eliminate, as much as possible, references to 'dry bulb temperature' or 'wet bulb temperature' or 'humidity' when we talk to the average prospect."

"Too much emphasis on engineering, we have found, scares the dealer, the prospect, and just about everybody else. Making it sound complicated sets up a barrier in the mind

of the prospect for a room cooler, and makes him harder to sell."

"So, instead of explaining how it operates, we simply tell the prospect what it will do—make his office, room, or home more comfortable when the weather's hot outdoors. We don't guarantee any specific indoor temperature; we just say that a room cooler will make him feel better during the summer heat wave. The equipment does what we say it will, and the customer is satisfied—without being all crossed up with a lot of engineering details that it doesn't do him any good to know, anyway."

A large percentage of the 1937 air-conditioning business, Mr. McGregor believes, will be in the hotel field. Trial sales already made to three of Memphis' largest hotels have convinced them of the potentialities of this market.

Mr. McGregor has installed room coolers in the Peabody, Claridge, and

Chisca hotels on a trial basis. In addition, he sold a larger size system to the Peabody management.

The trial hotel room installations were made to convince the managers of the larger profits obtainable with conditioning equipment during hot weather. Clerks were instructed to inform incoming guests that some conditioned rooms were available at rates \$1 per day higher than those without the equipment.

In every case, the rooms were kept filled without difficulty. As a consequence, several are planning to install a number of the room coolers next summer. The equipment will be of special value, Mr. McGregor believes, in assisting hotels to fill rooms on the third and fourth floors—those which are usually most uncomfortable during hot weather.

### TO FOLLOW RAILROADS

Hotel air conditioning will follow the example set by railroads, in Mr. McGregor's opinion.

"Many men who travel prefer to take a night train rather than stay overnight in a hotel—because the train is air-conditioned," he says. "If the hotel could offer conditioned, comfortable rooms, the chances are that they wouldn't mind staying there instead of moving on."

"Then, too, when a man leaves an air-conditioned coach, he'll go to an air-conditioned hotel, if there's one in town. He wants a continuation of the comfort he's just experienced. This builds up a clientele for the hotel—a class of guests willing to pay for extra comfort."

"Hotels, like the railroads, will find that customers will demand—and pay for—the convenience of air conditioning, once they've been given a chance to experience it."

## Donovan Sees Wider Applications and Studies of Benefits to Business as Two Major Accomplishments in 1936

BLOOMFIELD, N. J. — Marked broadening of the applications of air conditioning, resulting in much wider markets, plus collection for the first time of data showing, in facts and figures, the effects of air conditioning on commercial establishments of many kinds, are the two outstanding achievements of 1936 in the industry, according to J. J. Donovan, manager of the General Electric air-conditioning department.

"First adopted in homes, offices, and public meeting places like theaters, air conditioning has now demonstrated its value in innumerable other places," Mr. Donovan said.

"Many installations in hospitals have been made during 1936, in order to reduce the high mortality in hot weather, to improve post-operation care, to assist in treatment of respiratory diseases, and to provide better conditions in operating rooms. Again, a number of newspaper offices have found that air conditioning their printing rooms has improved the quality of their printing and the handling of paper and ink. Other applications of interest have been made in department stores, banks, hotels, and broadcasting stations."

"In raising certain types of vegetables, man-made climate has shown a surprising advance over nature by making possible an increase of 35 to 40% in yield. Vegetables thus favored produce an extra crop, and every crop is of better quality. The air-conditioned vegetable knows no season and is no longer subject to the limiting effects of heat and drought."

"For the first time, prolonged studies

of actual experience have shown that air conditioning steps up the business of retail shops from 17 to 43.25%, and of restaurants, 21 to 41%. The same studies, which could not be made prior to 1936 because there was insufficient background of experience, show that proper interior climate results in saving in handling and insures uniform quality of raw materials throughout many types of manufacturing plants.

### DISTRIBUTION BETTER

"Another important characteristic of 1936 has been the elimination of some of the bottle-necks which had been cramping distribution. Many more and much better trained engineers are now in the field who are able to present to the potential buyers the correct facts about air conditioning."

"Air conditioning is not a product, it is a service, and the selling of any service calls for intelligent factual presentation. Because of its technical aspects, air conditioning should be sold by men with engineering training."

"Until enough trained men were available for this purpose, distribution was seriously cramped. This condition has been altered very much for the better in the past 12 months."

Mr. Donovan foresees a good year in 1937. The normal increase in his business, he believes, will be aided by two other factors—generally improved business conditions throughout the nation, and the willingness of many industrialists to invest in plant equipment.



HIT RECORD REFRIGERATOR SALES WITH CCC FINANCE PLAN

### WAGE AND SALARY

increases, already in effect, will add more than \$130,000,000 to 1937 payrolls—with more to come.

That means additional millions of dollars will be spent by wage-earners for refrigerators and other electrical appliances for home pleasure and comfort.

Wage-earners are time payment buyers. The time payment plan you offer will have a lot to do with the closing of many of your sales. Get the best plan.

Profit by the national reputation of Commercial Credit Company, for low cost and dependable financing. Assure yourself of the benefits of Commercial Credit Company service, including careful credit investigation, prompt remittances and close cooperation from a local office in your own territory.

## COMMERCIAL CREDIT COMPANY

COMMERCIAL BANKERS  
CONSOLIDATED CAPITAL



HEADQUARTERS: BALTIMORE  
AND SURPLUS \$60,000,000

FINANCING SERVICE FOR MANUFACTURERS, DISTRIBUTORS AND DEALERS THROUGH 178 OFFICES IN THE UNITED STATES AND CANADA



## Western Auto Tries Out Appliance Retailing

(Concluded from Page 1, Column 1) appliances, was announced at a dinner meeting held here recently. Ralph V. Fritts, southern district manager for Western Auto, acted as toastmaster.

Speakers at the dinner meeting included: Warde B. Stringham, local appliance manager for General Electric Supply Corp.; Roy Augrain, manager of Western Auto's G-E appliance department; C. O. Brown, local appliance sales manager for G-E Supply; and Wil Galpin, retail manager, G-E appliance and merchandising department, Cleveland.

New Orleans is being used as a testing ground for Western Auto's experiments in the merchandising of household appliances in addition to its regular automotive line. If the plan works successfully, says Mr. Galpin, it will be extended to the 16 or 17 stores in the southern district and eventually to the national organization which embraces stores in 170 American cities.

## Crosley Markets Five-Tube Portable Radio

CINCINNATI—A new five-tube AC-DC superheterodyne portable radio receiver with two double-purpose tubes, retailing at \$16.95, has been announced by Crosley Radio Corp.

Designated Model C-516, the set is equipped with automatic volume control, a five-inch full tone dynamic speaker, airplane type dial, and requires no ground wire connection. Tuning range is from 540 to 1725 kilocycles, including standard and police broadcasts. Cabinet is of solid mahogany.

## G-E Appoints Managers Of 14 Districts

CLEVELAND—Appointment of 14 district sales managers to head the newly consolidated activities on all appliances manufactured at both Bridgeport and Cleveland headquarters of General Electric Co. was announced last week by P. B. Zimmerman, general sales manager of the company's appliance and merchandise department.

Those appointed as district sales managers and the districts in which each will work, follow: C. B. Connolly, Boston; A. C. Sanger, Philadelphia; T. B. Allen, Atlantic district; J. A. Ramsey, Buffalo; A. G. Cyffer, Pittsburgh; R. A. Shackelford, Cleveland; J. S. Strecher, Chicago; C. R. Thorson, Minneapolis.

R. V. McDonald, St. Louis; F. W. Wheeler, Dallas; E. W. Brown, Salt Lake City district; George West, San Francisco; F. M. Slator, Detroit; R. M. Laughrey, Portland, Ore.

In a previous appointment made by Mr. Zimmerman, Earle Poorman was named head of the New York territory.

## Norge Distributor Names New Sales Manager

MILWAUKEE—Vernon Maurer has joined Radio Specialty Co., local Norge and Philco distributor, as vice president in charge of Norge sales, according to General Manager Alvin Van Antwerpen.

Mr. Maurer was lately with Maurer-Greusel Co., former Grunow and now Crosley distributor in the Milwaukee territory.

He has also served as representative for Utica Heater Co. and Chicago Pump Co. In 1922 he established Badger Radio Co., and served in an executive capacity with this firm.

## Directs Norge Sales in Milwaukee



Vernon F. Maurer, new sales manager of Radio Specialty Co., Milwaukee Norge distributor, discusses early spring merchandising plans with Alvin Van Antwerpen, head of the organization.

## 'Blond' Color Vogue in Furniture, Started in Fred Astaire Pictures, Features Mart Shows

(Concluded from Page 1, Column 2) motion manager, directs the exhibit. Hotpoint (Edison G-E Appliance) is in Space 1722.

Frigidaire has one of the biggest of all the refrigerator displays, prepared under the direction of Daniel A. Packard, manager of the furniture and department store division.

According to Mr. Packard, the 1937 Frigidaires will be shown to dealers at previews all over the country beginning late in January.

Harry Humphries and Leo Hanlein of Mr. Packard's staff are on duty at the exhibit, as is F. H. Peters, who is in charge of the department and furniture stores division advertising and sales promotion.

Apex, Coolerator, Universal (Landers, Frary & Clark), Hercules, Sanitary, and Zero Plate (commercial) refrigerators are on display in the Merchandise Mart. Zero Plate exhibit is on the eleventh floor; all others on the fourteenth.

In the display of furniture and home furnishings, modernism again is the keynote. Glass and chromium are much-used materials. Furnishings for trailers are a new feature of the show.

"Blond" is the new color for wooden chairs, beds, tables, desks, and dressers. This newest material in furniture is bleached maple, which harmonizes well with the crystal, chrome, and "flat" colors which predominate in modernistic designing.

According to one designer, Fred Astaire was indirectly responsible for this new mode. Astaire likes to do his dances in black evening clothes; and Hollywood set designers, seeking backgrounds against which his black figure would stand out, hit upon the idea of bleaching maple. Thus a new vogue was created.

One reaction away from the modernistic motif is the return of the old-fashioned rocking chair—shown by several exhibitors in Colonial and Early-American styles.

In conjunction with the shows, the National Retail Furniture Association and the National Wholesale Furniture Salesmen's Association are convening.

Headline speaker of the NRFA convention is Congressman Wright Patman, co-sponsor for the much-discussed Robinson-Patman Act. Congressman Wright Patman is billed to appear at the banquet Wednesday night at the Stevens hotel which will be attended by close to 1,000. Harold Van Orman of Evansville, Ind., is to be toastmaster.

Thursday night the NRFA has reserved all tables in the Chez Paree club for a gala evening.

Chicago hotels are jammed with buyers, and beds are at a premium throughout the city. The following hotels were entirely sold out for several days in advance of the opening: Drake, Lake Shore, Seneca, Allerton, St. Clair, Eastgate, Knickerbocker, Croydon, Bismark, Medinah, Sherman, and Morrison.

Home furnishings stores of the nation will do an average of 14% better volume in 1937 than they did in 1936, if the verdict of owners of more than 300 stores is upheld by general business condition, believes the Na-

tional Retail Furniture Association. This is based on the association's third annual survey.

In the first survey, a forecast of 16% better business in 1935 over 1934 was upheld by the results. In 1936, an increase of 16% over 1935 was prophesied, and actual results for the first 11 months of the year, according to NRFA controllers' division reports, showed the official figure to be 19%.

The average of all stores forecasting an increase in 1937 was 16.7%, but this figure was lowered by the stores which said they believed they would do about the same volume as last year.

Stores which said they would do the same amount of business in 1937 as in 1936 indicated that they wished to decrease their installment sales in order to place the stores in a more liquid position.

Other variables considered were the amount of labor difficulties which might arise, and in the drought area, particularly, weather was cited as a factor playing an important but unpredictable part. The severe winter of 1936 kept volume down decidedly during the first two to three months, and the big gains were registered thereafter.

During the first 11 months of 1936, the New England and Middle Atlantic states showed a 15% increase; the North East Central group 24%; South Atlantic, South East Central and South West Central 20%; West Mid-Continent, North West Central and Rocky Mountain 10% and the Pacific Coast 24%.

Price increases at the market opening today will be whatever the traffic can stand, Mr. Rau intimated . . . pointing out that this boils down to the question of how much of a rise the consumer can absorb.

"On lower end merchandise, a 10% increase over last quoted prices might not be unreasonable," the association concluded.

## Wildermuth Opens Used Refrigerator Store

GREENWICH, Conn.—E. A. Wildermuth, Kelvinator distributor for the New York metropolitan territory, will open a new showroom at 405 Greenwich Ave. here, to be devoted entirely to the merchandising of used and rebuilt refrigerators. The store contains floor space of approximately 9,000 sq. ft.

## Geddes Joins Dept. Store Division of G-E

CLEVELAND—E. T. Geddes, formerly assistant manager of the General Electric Co.'s campaign division, and secretary of The Toppers Club, is now affiliated with department store activities of the G-E specialty appliance sales division.

## Kelley-How-Thomson Sell Stewart-Warner

(Concluded from Page 1, Column 5) pleted the negotiations with officials of the new distributing organization which were immediately followed by a special sales conference held in Duluth on Dec. 29 and 30 at which time Stewart-Warner's new line of refrigerators was presented to the Kelley-How-Thomson organization.

C. R. D'Olive, chief refrigeration engineer of Stewart-Warner, presented the new line of refrigerators; Mr. Kelsey outlined the sales promotion and advertising plans; and R. S. Brunhouse, district factory sales representative, gave complete details of the various finance plans. R. W. Higgins, vice president of Kelley-How-Thomson, presided.

A series of dealer meetings will be held from Jan. 11 to 20 in Duluth, St. Paul, Minn.; Fargo, Bismarck, and Minot, N. D.; Great Falls and Billings in Montana.

## Worthington Corp. Absorbs Carbondale Subsidiary

HARRISON, N. J.—Effective Jan. 1, 1937, Worthington Pump & Machinery Corp. was to absorb its subsidiary Carbondale Machine Corp., it was announced last week. Carbondale organization, products, and sales activities will be continued as a division of Worthington.

## New York Leads November Sales With 10,062

States and Territories	Quantity of Household Low Sides
Alabama	546
Arizona	48
Arkansas	328
California	4,720
Colorado	871
Connecticut	1,045
Delaware	76
District of Columbia	340
Florida	1,966
Georgia	1,936
Idaho	205
Illinois	6,744
Indiana	2,084
Iowa	845
Kansas	971
Kentucky	706
Louisiana	295
Maine	22
Maryland	328
Massachusetts	2,028
Michigan	4,734
Minnesota	1,584
Mississippi	112
Missouri	2,339
Montana	172
Nebraska	838
Nevada	84
New Hampshire	68
New Jersey	3,628
New Mexico	66
New York	10,062
North Carolina	927
North Dakota	246
Ohio	4,721
Oklahoma	629
Oregon	1,253
Pennsylvania	5,247
Rhode Island	401
South Carolina	383
South Dakota	127
Tennessee	789
Texas	2,129
Utah	137
Vermont	42
Virginia	946
Washington	1,624
West Virginia	489
Wisconsin	1,267
Wyoming	73
<b>Total United States</b>	<b>71,221</b>
Canada	517
Other Foreign (including U. S. Possessions)	6,327
<b>Total for world</b>	<b>78,065</b>

This summary includes adjustment figures reported by several companies which do not represent their actual November sales but are corrections to be applied to their first ten months totals to give their correct total apportionment among the various states for eleven months.

# A FREE BOOKLET

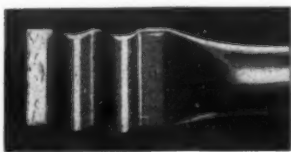
reprinted  
TO MEET  
THE DEMAND



## "Hints on Cutting, Flaring and Bending Copper Tubing"

This booklet, reproduced in part in a previous issue of this magazine, created so much interest and so many requests for copies that a reprint was necessary. Manufacturers and service men alike find it fills the need for practical information on handling copper tubing. We can now fill all requests promptly. If you haven't a copy, write for it today.

"Craftsmanship in production" has become the slogan of the men who make Wolverine Tubing. Carefully annealed copper tubing is friendly to work with. That is why it is so responsive to your touch. When you demand Wolverine Copper Tubing you get the extra value found only in tubing produced "by craftsmen for craftsmen."



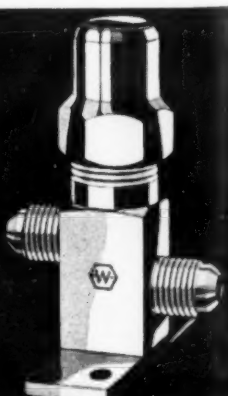
Wolverine Copper Refrigeration Tubing is solder-sealed to keep it clean.

# WOLVERINE TUBE CO.

1421 Central Avenue Detroit, Mich.  
Cable Address "Robns-Detroit"

# WEATHERHEAD

REFRIGERATION PARTS • "ALWAYS BETTER"  
THE WEATHERHEAD COMPANY • CLEVELAND, OHIO





The Edgely Brass Co.  
Edgely, Pa.  
Founders Machinists Platers  
Distributors of "Gerick" Lift & Drop  
Shelf Hinge

Dear Sirs:

Do you have any lists showing manufacturers of show cases and refrigerators  
F. A. BARTON

H. M. Rehmeier  
Distributor  
York, Pa.

Gentlemen:

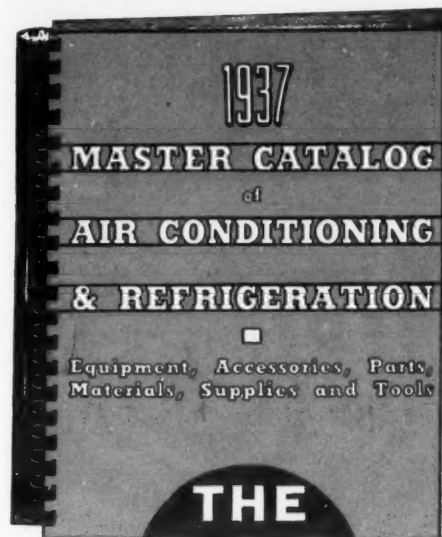
Kindly give us a list of manufacturers of some of the most popular makes of self contained air conditioning units.  
H. M. REHMEIER

Carrison-Downs Co., Inc.  
Distributors  
York Ice Machinery Corp.  
Jacksonville, Fla.

Gentlemen:

Please reserve for us a copy of the Master Catalog of Air Conditioning and Refrigeration, which we understand from your recent news item is to be published in March

J. WAYNE MOORE, JR., Engineer.



THE  
RED  
BOOK

50,000  
COPIES

Thermal Service Co., Inc.  
Jobbers  
Supplies, Controls, Parts  
Automatic Heating, Refrigeration,  
Humidifying and Air Conditioning  
St. Paul, Minn.

Gentlemen:

We are interested in getting in contact with manufacturers of "Capacitors" for refrigeration motors to be used for replacement. H. W. SMALL,  
President

Insular Products Co., Inc.  
San Juan, Puerto Rico  
Distributor

Will you please send by return Air Mail a list of medium and low priced soda fountain and soda fountain equipment.

INSULAR PRODUCTS CO., INC.

The Shepard Co.  
Providence, R. I.

Gentlemen:

We would greatly appreciate your reserving and sending us a copy of your Red Book "1937 Master Catalog of Air Conditioning and Refrigeration."

V. P. HOTZ,  
Manager, Refrigeration Dept.

## ACTIVE BUYERS - - - 12c per doz.

The Red Book offers the opportunity for manufacturers to contact active buyers throughout the air-conditioning and refrigeration industry at a cost of only 1¢ per name. This 1¢ buys a full page in one copy of the Red Book and it will reach a buyer who is interested.

Through the Red Book it is possible to blanket the entire market at small cost and lay the foundation for acquiring new customers and increasing sales in 1937.

The Red Book can be used effectively as an important part in the entire advertising and sales promotion program.

It will supply *broad* coverage.

It will supply *effective* coverage—as it will be sent upon request.

It will supply *low-cost* coverage—the cost of a page being less than that of a post card.

It will supply *long-life* coverage.

Your page or insert in the Red Book should be written and illustrated for the purpose of getting business—actually bringing in orders—for it is a *catalog* and will be used as such.

As a rule, manufacturers do not hesitate to mail a catalog in response to an

inquiry from a good prospect. A page or an insert in the Red Book is, in effect, an answer to an inquiry—and the cost is only 1¢ per page per copy.

The Red Book will be distributed free upon request to those who are active buyers or have active "buying influence" in the industry. Since the opening announcement of the coming publication of the Red Book, requests for copies are being received through the daily mail in increasing quantity.

Plan to use the Red Book for establishing new contacts, opening up new accounts and developing new business in 1937.

**Rates and terms:** Total circulation: 50,000 copies. Closing date: February 1, 1937. Publication date: March 1, 1937. Type page size: 7 inches x 10 inches. Trim page size: 8½ inches x 11 inches. Untrimmed insert: 8¾ x 11¼ inches. Plastic or spiral wire binding. Advertising rate: \$500 per page. INSERTS: When printed by the advertiser on 80-lb. stock and delivered to publisher: 2 pages @ 450, \$900; 4 pages @ \$400, \$1,600; 8 pages @ \$350, \$2,800; 16 pages @ \$300, \$4,800. Halftone screen: 133 lines.

Commission to advertising agencies approved by Associated Business Papers: 15%.

Terms: 2% cash discount if paid on or before February 1, net March 1, 1937.

**Business News Publishing Co.**

Publishers of Air Conditioning and Refrigeration News

5229 Cass Ave., Detroit, Mich.

Advertising Representative: John B. Gallagher Co.—New York and Chicago



### Canadian Rockwool Co. To Increase Production

BRANTFORD, Ont., Canada—Output and personnel of Rockwool Corp. Ltd.'s plant will soon be doubled, according to an announcement made by O. F. Mottweiler, who recently took charge of the company's Canadian factory.

Two new cupola units are added to the factory, and head offices of the company are being moved here from Toronto. A sales office will be maintained in Toronto, however.

Mr. Mottweiler, of Alexandria, Ind., is head of the parent company, Gimco Products, in the United States.

### Williams Reports Year's Profit of \$259,500

BLOOMINGTON, Ill.—The Williams Oil-O-Matic Heating Corp. reports a net profit of \$259,500 for the fiscal year ending October 31, as compared with net profit for the preceding fiscal year of \$213,944.

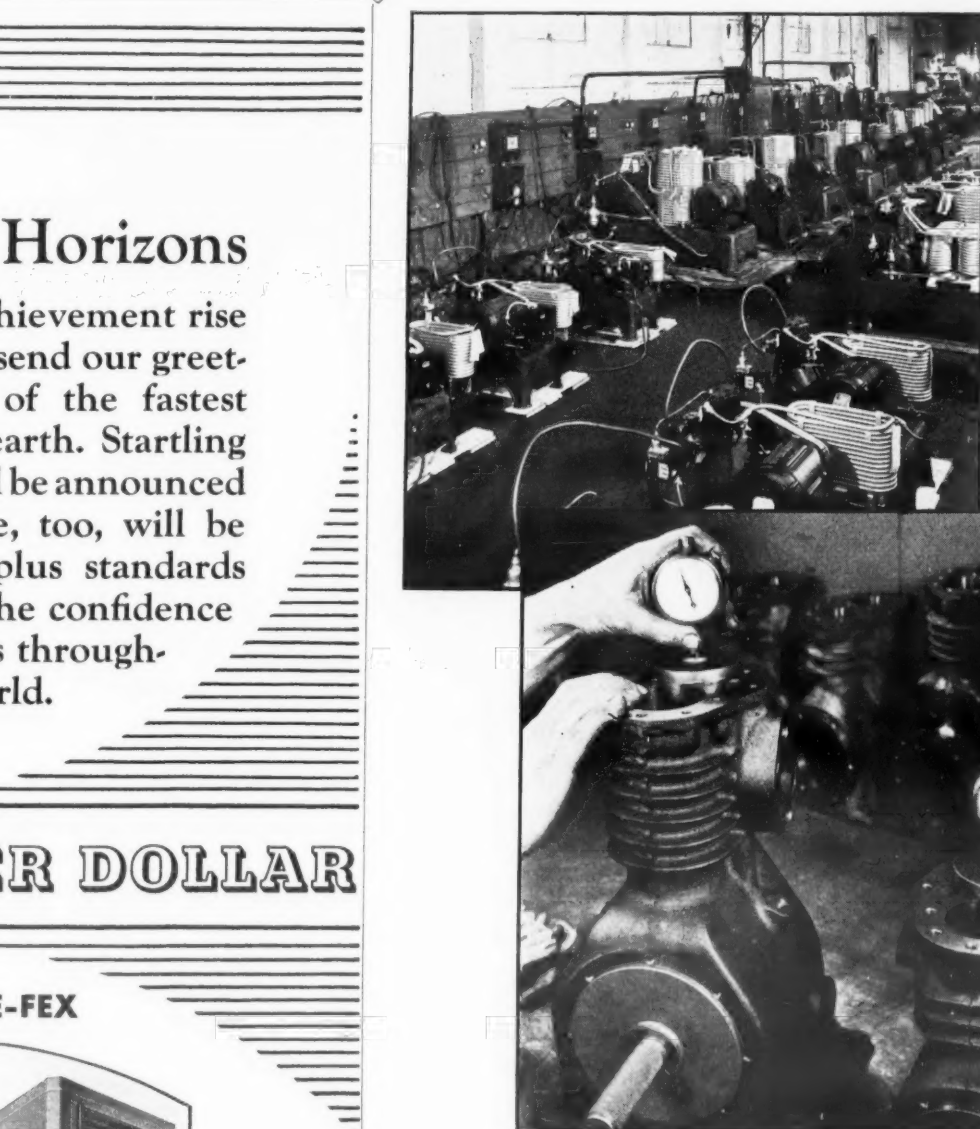
This 1936 figure equals 60 cents per share on 430,000 shares of capital stock, as against 49 cents per share covered in the profits of the previous fiscal year.

### Ballus to Take Charge of G-E Dept. Store Sales

CLEVELAND—Carl Ballus, formerly manager of the General Electric Supply Corp.'s Akron branch, has been transferred to General Electric headquarters to take charge of department store sales in affiliation with R. C. Cameron, assistant manager of the sales division of the appliance and merchandising department.

Mr. Ballus has been associated with the General Electric Co. since 1928, when he joined the Willis Co., Canton, Ohio distributor.

## Precision Methods in Manufacture of Commercial Units



A combination of individual precision operations and mass production methods are employed in plants building household and commercial refrigerating machines, as exemplified by these unusual photographs taken at Universal Cooler. Although compressors are tested on run-in jacks by the hundreds it is necessary to have individual production on every part in connection with the various items manufactured by the company.

One of these individual production activities is the balancing of flywheels on both commercial and domestic units. The balancing machine shown at the top left serves a number of functions to bring about the utmost in running precision.

The flywheel is placed horizontally on a balancing table which soon indicates the position of the balance and excess weight on one particular segment of the wheel. Through the location of this "heavy side" the scale device is set and finally shows: (1) The number of holes necessary to balance; (2) The depth to drill each hole; (3) The angle of each hole to be drilled. When these functions have all been carried out the wheel is then put on an axle gauge and set as shown in the small inset illustration at the top left. It is tested until the wheel will maintain a balance at any position it is set. The nine compressor blocks at the bottom indicate the scope of the commercial line.

Although the majority of run-ins of actual condensing units on Universal Cooler test line is along the endless belt type of production the extremely large units must of necessity be tested on individual dollies as shown in upper right illustration. The lower picture to the right shows an additional step in testing compressors, this particular one to ascertain whether the distance between the crankshaft and head of compressor is within plus or minus one-thousandth of an inch.

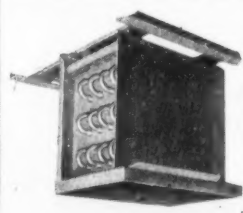
## Toward New Horizons

As new horizons of achievement rise with the new year we send our greetings to all members of the fastest growing industry on earth. Startling new developments will be announced by us in 1937. These, too, will be built to the quality-plus standards which have won us the confidence of cooling experts throughout the world.

## MORE BTUs PER DOLLAR

### 1937 COMF-E-FEX

New design ceiling-type room conditioner. Ideal for hotels, hospitals, etc. Cools or heats with water in con-



nection with central plant. Can be equipped for Freon or Methyl-Chloride. Element and housing mount separately.

## REFRIGERATION APPLIANCES, Inc.

H. J. KRACKOWIZER, President

1342 WEST LAKE STREET, CHICAGO

### Kelvinator Foundation Issues New Booklet On 'Temperatures'

NEW YORK CITY—Proper temperatures for dishwashing, laundering, cooking, refrigerating, and hot water supply, have been established through recent experiments conducted by Kelvinator Corp.'s Temperature Research Foundation and similar organizations.

Frances Weedman, director of the Kelvin Kitchen and consultant to the Temperature Research Foundation, says that although every housewife now has at her disposal dishwashing machines, laundering machines, electric refrigerators and ranges, and modern means of supplying hot water, she cannot operate these appliances most effectively until she knows the proper operating temperature.

In the field of dishwashing, experiments recently conducted by the household equipment division of the home economics research at State College of Washington indicate that water at 135° F. is generally the hottest that human hands can stand.

Much hotter water can, of course, be employed with mechanical dishwashers. The American Institute of Electrical Engineers has specified a temperature of 160° F. as ideal for dishwashing. Water of this temperature not only speeds the dishwashing process, but most effectively destroys pathogenic bacteria.

A study of home laundering temperatures conducted in the Washington Experiment Station has resulted in the recommendation of temperatures from 90° to 140° F., depending upon the type of fabrics washed. Higher temperatures are to be avoided because articles of clothing worn next to the skin contain body fat and albumin, which is cooked into the fabric by temperatures above 158° F.

Correct temperatures for roasting meats in the oven of an electric range depend not only upon the kind of meat to be roasted, but also upon the size of the cut and the degree of rarity desired, according to Miss Weedman.

Temperature control is, of course, the prime consideration in food preservation. Most micro-organisms responsible for food destruction work most rapidly and efficiently at temperatures between 60° and 122° F. Cold

does not destroy bacteria, but it does restrain their growth and activity, and at a temperature below 50° F. most of them do not increase notably.

The type of food to be preserved determines, to a large extent, the temperature which should be maintained, according to Miss Weedman. For instance, she continued, 40° F. is ideal for milk, while eggs, vegetables, fruit, etc., will keep nicely in temperatures varying from 46° to 49° F.

Miss Weedman pointed out that the temperature within a modern refrigerator varies only about 4°, but even this slight variation makes it desirable that the coldest position should be reserved for milk and cooked milk left-overs. Eggs, on the contrary, can be safely kept in the warmest spot in the refrigerator, providing this does not drop below 49° or 50° F.

### C. I. T. Establishes Branch In Wilmington, Del.

WILMINGTON, Del.—C.I.T. Corp., finance company, has opened a branch office in the Equitable Trust building here. D. W. Pratt will be in charge of dealer service, and G. D. Leffler will be branch credit manager.



### University of Delaware to Conduct Freezer School

NEWARK—University of Delaware will conduct a two-day school for instruction in counter freezer operation Jan. 28 and 29.

The course will be open to university students and the general public. At the time of registration, each applicant must pay a \$11 fee to cover minor installation expenses. No other charge will be made.

Several concerns manufacturing counter freezer equipment and supplies are cooperating by loaning materials and furnishing demonstrators. Prof. T. A. Baker of the department of animal industry will be in charge of registration and general arrangements. Prof. W. F. Lindell of the department of mechanical engineering will take charge of the mechanical set-up.

Dean R. L. Spencer of the school of engineering has given permission to use the school's mechanical laboratory for demonstrations and practical laboratory work.

### Servel Unit Used to Harden Paraffin Tape for Bottles

EVANSVILLE, Ind.—Bernardin Bottle Cap Co. employs a 1/2-hp. Servel condensing unit and Humidraft to harden the paraffin-dipped paper tape which is placed in bottle caps to assist in sealing the caps on the bottles.

The tape, after being dipped, passes through a special housing or compartment built around one section of the conveyor. Here the paraffin is hardened by the cooling effect of the Servel unit. When the wax is congealed, the tape moves on to the stamping machine.

Japanese swordfish industry has greatly improved its inspection of the fish, and the percentage of jellied fish now is much smaller than before. Still the domestic product continues to be preferred, because jellied fish in the domestic pack are practically unknown.

Canada, which until 1929 was the sole source of importation, never has supplied very large quantities.

During the swordfish season, between 1,000,000 and 2,000,000 lbs. of swordfish are imported from Canada. These usually are not distinguished from the domestic product and are sold at the same wholesale and retail prices. Since the Canadian fish move through practically the same channels of distribution as the domestic fish, a small part of the "domestic production" of frozen swordfish consists of Canadian fish frozen in U. S. freezing plants.

Although there is scarcely any direct competition between frozen swordfish, either domestic or imported, and that marketed fresh, the anticipation of imports of frozen fish lessens the demand of domestic buyers during the fishing season, and thus tends to reduce the price of all swordfish caught on American vessels.

Average rates charged by the three Boston freezing plants, according to a Tariff Commission survey conducted

over a period of representative years, are: 65 cents per 100 lbs. for freezing and first month's storage; 25 cents per 100 lbs. for each additional month's storage.

Rates for imported swordfish follow: 35 cents per 100 lbs. for first month's storage; 25 cents per 100 lbs. for each additional month.

Freezing alone, therefore, costs 30 cents per 100 lbs.

Frozen swordfish imported from Japan has usually sold at lower prices than the domestic product, although the price difference has narrowed greatly in the last two years. This difference is caused primarily by the poor reputation acquired by early Japanese imports.

Average domestic cost of production of frozen swordfish over a representative period was 13.9 cents per pound. The cost was the cost to the wholesaler and included the average price at which he purchased the fish, the price paid for freezing and storage, and his hauling and costs.

Judged by such figures as were available, the average cost of the similar Japanese product during this same period was 10.1 cents per pound. This included transportation and delivery charges to Boston, and the 1.2 cent charge made by U. S. commission merchants.

### Pelco Markets Line Of Combination Units

BLOOMINGTON, Ill. — The 1937 line of Pelco electric beverage-food coolers, manufactured by Portable Elevator Mfg. Co., includes three models designed to cover all requirements of the market, according to E. W. Jones, sales manager of the company's refrigeration division. Pelco's beverage coolers are being produced in two sizes.

Heading the Pelco combination coolers is the Model 200, with a 14.66-cu. ft. storage capacity. The wet compartment holds 138 12-oz. bottles standing. Model 240 beverage cooler holds 240 12-oz. bottles standing, and is deep enough for half-gallon bottles.

All models are of the "package" type, ready to be plugged in.

Construction of the boxes has undergone little change. Made of galvanized steel, they are heavily insulated and Hydrolene sealed. The combination coolers have hinged lids; those on the beverage coolers are of the sliding type.

## —COMMERCIAL REFRIGERATION—

### Production of Frozen Swordfish Is Growing In Many U.S. Ports

WASHINGTON, D. C.—Production and distribution of frozen swordfish comprises a sizable industry in some sections of the country, according to a report published by United States Tariff Commission.

The swordfish, one of the largest and most highly valued of food fishes, is caught almost entirely by use of a harpoon. Its weight averages 200 lbs., though sometimes fish as heavy as 800 lbs. are caught.

At the fishing ports the fish are graded by the buyer according to size and quality. Most of the catch is then cut into chunks, packed in crushed ice, and sold fresh for immediate consumption. The remainder is frozen and kept in cold storage for use in winter, when no swordfish are caught.

#### CUTTING FOR SALE

On removal from the cold storage house, the fish are sawed into chunks of varying sizes according to the needs of various retail outlets. Few retail stores have facilities for holding the fish in frozen condition. When sold at retail the fish is thawed, and the average customer cannot distinguish it from the fresh fish.

A small part of the domestic pack consists of steaks, separately wrapped, and frozen by quick-freezing methods. This small portion is more costly to prepare, and is not comparable with swordfish frozen whole or in large pieces. There are no quick-frozen steaks in the imported product.

Boston is the center of domestic swordfish production and the principal port of entry for imports. Maine and California produce most of the remaining domestic supply.

About four-fifths of the entire domestic production is frozen in Boston, where three public plants are located. These plants do not own the fish but simply freeze and store it at specified rates. The "producers" of swordfish—that is, those who own the fish sent to the plant for freezing—consist mainly of wholesalers, restaurant and hotel supply dealers, and the fish departments of chain stores.

The number of producers varies considerably from year to year, depending upon the catch, the price of fresh fish, and the producers' estimates of the supply that will be available during the ensuing winter months. One freezing plant handled swordfish for more than 50 different concerns during 1934.

Domestic production, however, especially in Boston, has been on the downward trend since 1929, declining from 1,337,000 lbs. in that year to 395,000 lbs. in 1934.

#### CENTERS OF IMPORT

During the winter of 1934-35, about 70% of the total domestic consumption of frozen swordfish was imported. About 60% of these imports entered at Boston; the remainder at Los Angeles and New York.

Imported swordfish is prepared in much the same way as the domestic product, and comes principally from Japan and Canada.

Japanese imports, first entered in 1929, have increased from 113,000 lbs. in that year to 1,561,000 lbs. in 1934. The Japanese fish are usually shipped to the United States on consignment and sold through American commission merchants to the same wholesalers who buy and freeze American swordfish.

Japanese fish can readily be distinguished from the domestic variety by the style of trimming or dressing, and the method of wrapping. Each fish is sewed in cotton and burlap wrapping which usually is not removed until the fish is cut up. After the fish has been cut up, there is no means of distinguishing it from the domestic product.

The Japanese product acquired a poor reputation during the first few

years of its importation, because of its obviously inferior quality. The fish were not carefully dressed or washed, and many of them were jellied from having been diseased.

In the last few years, however, the



# A CLEARING HOUSE for TRAINED PERSONNEL

Plans and Facilities Now Being Developed For a Wide and Helpful Service to Employers

Our job primarily is to train men for employment in the many technical branches of the refrigeration, air conditioning, and heating and ventilating fields. But we see ahead even a wider service to be rendered to these industries through the development of a clearing house for trained personnel of many kinds. This is a part of our plans for 1937 and the years ahead . . . to bring together employers and the trained personnel they need . . . to eventually, through the wider application of the most remarkable training program ever devised, relieve manufacturers and others from the necessity of operating their own training schools.

At the present time we are receiving requests for men from all parts of the United States, and from foreign countries too. Typical of these requests are the following from one day's mail.

From a large machinery manufacturer:

"We are looking for a highly trained man, capable of designing centrifugal and axial type fans and blowers. Will you be good enough to put us in touch with such a man if you can."

From a leading furnace manufacturer:

"We are looking for a man who has specialized in air conditioning and who has had both manufacturing and laboratory experience in this industry. This man should have a knowledge of cooling equipment design and application, and be well versed in test methods and procedure. He should be creative, resourceful, and capable of directing new developments. If you could put us in touch with someone who has the necessary qualifications, we will be deeply grateful."

From a leading manufacturer of refrigerating equipment:

"Have you a graduate, preferably with

some practical experience, whom you are willing to recommend wholeheartedly as a refrigeration service man? We have a distributor who is unable to find exactly the type of man he wants and if you know such a man, we would like to have his name and address, so we can put our distributor in touch with him."

We welcome requests such as the above and will do our utmost to send to employers the exact type men required. Of course there will be no charge either to the employer or to the man employed.

...

To some it may seem to be a far too ambitious program for one organization to attempt to train all the men required for service, installation and maintenance work in the great and growing fields of refrigeration, air conditioning, heating and ventilating. It is an ambitious program, but a program that is already effectively functioning and headed for just that result, due to the unparalleled cooperation given to it by so many leading concerns.

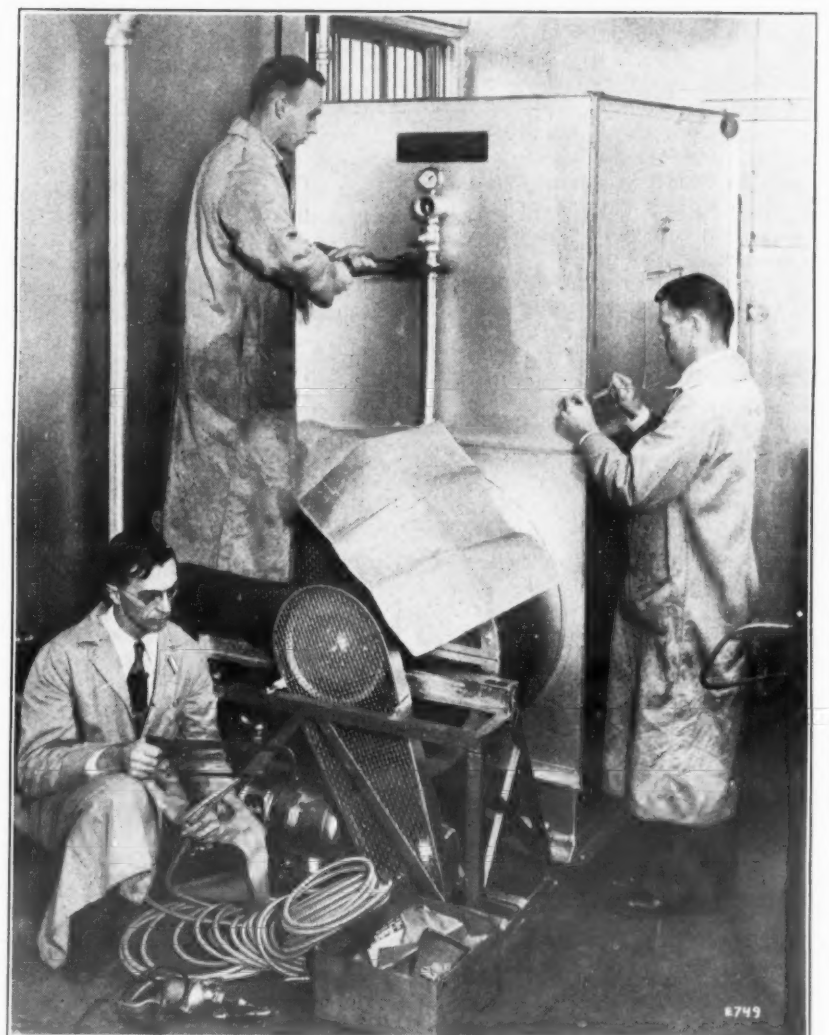
Most leading firms in these fields have already contributed material, advice and counsel. Fifty outstanding manufacturers have given the program their official endorsement and among them have appointed their own engineers to supervise it. Thus it has already become a constant and dependable source of competent technicians . . . men trained exactly as the industry wants them trained, under the supervision of a manufacturer-appointed Board of Governors.

Employers, engineers, executives, are invited to write for complete details and to visit the Institute and inspect its methods and facilities. When in Chicago, telephone us and a car will be sent to pick you up and set you down again at any point in the city.

*Raymond Smith*  
PRESIDENT



Refrigeration and Air Conditioning Institute ★ 2130-2158 Lawrence Ave., Chicago



Above: Water cooling tower unit recently installed in \$35,000.00 Laboratory and Shops where students work in a practical way on commercial refrigeration and air conditioning installations. Part of their training here is with methods and equipment devised for the conservation of water.



Right: View in commercial refrigeration shops.

The Institute's Laboratory and Shops will be greatly enlarged in size, scope and equipment in 1937.



## Beginning—

### A New Air-Conditioning Series

On this page is the start of a new series of articles, "How to Select and Install Air Conditioning Systems," which will be of exceptional interest and value to every individual who has any part in the estimating, engineering, and installation of air-conditioning equipment.

These articles or "cases" come out of the experience of a man who everyday meets and solves the problems that he writes about. T. H. Mabley, author of this new series of articles, is chief engineer of Mechanical Heat & Cold, Inc., Detroit air-conditioning distributing and contracting firm.

Out of his experience with this firm and other contractor-dealers with whom he has worked Mr. Mabley will outline the procedure in selecting and installing equipment for specific applications, and will discuss any special features of the job which may be involved.

In his first article, which covers perhaps the most simple of installations, Mr. Mabley takes some time to discuss fundamentals of procedure, but in future articles he will plunge immediately into the problem at hand, without going into long explanatory discussions of the procedure involved or the basis of fundamental engineering data which are used in the calculations and estimates.

## HOW TO SELECT AND INSTALL AIR-CONDITIONING SYSTEMS

By T. H. Mabley, Chief Engineer,  
Mechanical Heat & Cold, Inc., Detroit

### Case No. 1

#### A Single Office

Each air-conditioning problem has its own individual characteristics, but also has a similarity to others in the manner in which it is handled. In general a certain procedure is followed in tackling almost every air-conditioning application.

First, we determine what we want to accomplish. In other words, looking at the four major functions of a complete air-conditioning job, namely; (1) temperature control, (2) humidity control, (3) circulation, (4) filtration, we decide what part of a complete air-conditioning application we are interested in making.

After establishing what we want the equipment to perform we arrive at the second step which is to determine what will be the performance limits or so called "design conditions."

If it is a winter air-conditioning job we will be interested primarily in the minimum temperature and humidity and consideration will prob-

ably be given to proper circulation, and also filtering.

If the problem is one for summer air conditioning only we will be concerned with the maximum limits of temperature and humidity and likewise give consideration to circulation and air cleaning. For a year-round application we will make a combination of these two.

Standard practice based on experience and tests have established the approximate maximum and minimum limits of these four functions for various types of applications. It is true that these limits have not been accurately established, but we have many sources such as the A.S.H. & V.E. Guide and others based on scientific tests and studies which give us sufficient information to establish fairly satisfactory limit design conditions. Only minor changes are anticipated as these tabulated data are further developed.

The third step in this application procedure is to calculate what will be required of the air-conditioning equipment in terms of the output and air volume. This in general will require calculations of heat loss or heat

gain loads, or both, consideration of ventilation requirements and observation of air-purity conditions.

Having determined the output required of the equipment for the specific application, the fourth step is to select the proper-sized equipment. This will necessitate a study of the physical conditions of the job, and in some cases, will require considerable judgement as to just what type of a system would be best suited for the application.

The fifth and final step is to determine the procedure for the actual installation. This, of course, involves a more careful study of the physical details of the job, a consideration of the power, water, steam, and other facilities available, and a proper location of the equipment. This step would not be complete without the, altogether too much neglected, final adjustment of the system.

As illustration of the general procedure outlined let us now consider our first air-conditioning problem. While this is a typical office it might even be a hotel room or room in a home.

In this particular case we have a room located on an intermediate floor. It is assumed that the rooms above and below the room under consideration are at normal indoor temperature. Similarly the adjacent rooms are normally occupied and are also at inside temperature. The room is normally occupied by not more than two people.

Dimensions of the room and other pertinent data are shown in Fig. 1.

First we determined that our problem is to provide a partial year-round air-conditioning job. The occupant of the room is interested not only in comfort for the summer, but realizes the healthful advantages of being able to maintain an even temperature in the winter time as well as raise the relative humidity. In this particular case the time of air cleaning by filtering is eliminated in as much as the surrounding conditions are rather clean and the atmosphere is fairly free from smoke and dust.

Since the occupants are not habitual smokers, we will not consider any forced ventilation, so the function of air circulation will be limited only to that amount of air necessary to the functions of temperature and humidity control. Our problem thus is a very simple one in which we must consider primarily the temperature and humidity.

Now, the second step is to determine that the minimum temperature for comfort in winter months should be 70° inside and from the weather records and other available data we select a temperature of -10° as a minimum outside winter design condition. Our humidity condition in winter will be somewhat limited by the maximum point at which the windows will sweat. This means that

### Diagram Showing Placement of Equipment

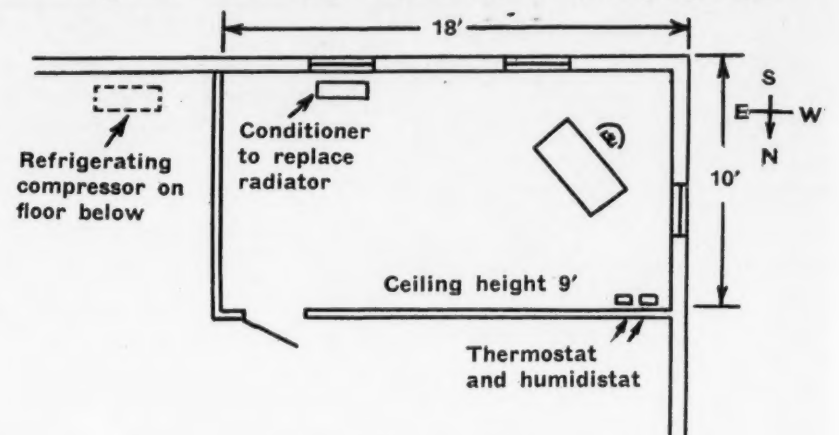


Fig. 1. Sketch showing recommended location of conditioner room controls, and placement of desk to insure maximum comfort to occupant.

### Table 1—Heat Loss & Heat Gain Calculations

Heat Loss		B.t.u.'s
Wall—224 sq. ft. x 80 x .40		7,168
Window—45 sq. ft. x 80 x 1.13		4,068
Infiltration Loss—84 c.f.m. x 80 x 1.03		6,922
Two Air Changes—84 c.f.m. x 40 grains x .64		2,150
<b>Total</b>		<b>20,308</b>
Add 10% for Exposure		2,031
<b>Total Heat Loss</b>		<b>22,339</b>
Heat Gain		B.t.u.'s
Walls (South)—132 sq. ft. x 15° + 10° (for solar effect) x .40		1,320
(West)—75 sq. ft. x 15° x .40		450
Windows (South)—30 sq. ft. x 45 B.t.u. (solar effect with awning)		1,350
(West)—15 sq. ft. x 15° x 1.13		244
Ceiling—180 sq. ft. x 12° x .52		1,123
Floor—180 sq. ft. x 12° x .52		1,123
Partition and Door—224 sq. ft. x 12° x .36		2,688
Occupancy—Two People x 220 B.t.u.		440
Lights—200 watts x 3.4		680
Infiltration—84 c.f.m. x 1.03 x 15°		1,298
<b>Total</b>		<b>10,716</b>
Latent Heat		B.t.u.
Occupancy—Two people x 180 B.t.u.		360
Infiltration—84 c.f.m. x (98 less 76 grains) x .64		1,183
<b>Total Latent Heat</b>		<b>1,543</b>
Add 5% Safety Factor		613
<b>Total Heat Gain</b>		<b>12,872</b>
Ratio of Sensible Heat to Total Heat: .82		

during the winter we will be able to raise the relative humidity in the room, but the actual percentages will vary from a minimum of 20% to a maximum of 50% depending on outside temperatures.

#### DESIGN CONDITIONS

For summer design conditions we select a maximum inside temperature of 80° F. dry bulb with the relative humidity approximately 50%. This maximum condition is to be maintained unless the outside temperature exceeds 95° W.B. and 75° D.B.

These selected inside and outside conditions are chosen as a design basis and are not fixed operating temperatures. As the outside temperature decreases the difference between inside and outside is reduced in a sliding scale fashion and in the same manner, as the outside temperature rises above 95° D.B. the temperature differential increases.

The third step involves the heat gain and heat loss calculations which are as follows:

While the quantity of air to be circulated may be calculated this computation will be eliminated in this case as we are primarily interested in handling sufficient air to give the cooling and heating performance required of the equipment.

In selecting a single room unit on the basis of B.t.u. output from manufacturers' catalogues we find the air quantities already determined. However, it is advisable to check the air circulation capacity of a unit to assure that there will be a sufficient number of air changes to give the proper temperature distribution throughout the conditioned area, and yet not so many as to cause any feeling of rapid air movement.

#### SELECTING EQUIPMENT

In the fourth step we determine the type and size of the equipment. We decide that by replacing the radiator with a cabinet unit we can make the most economical use of space. We further determine that the cooling compressor should be remotely located for at least three reasons: (1) space on the floor below could be used more economically (2) any additional noise in the office might be objectionable (3) adequate power and water is more readily available on the lower floor. These factors are enough to offset the extra cost of

refrigerant lines and separate equipment.

From the performance rating sheets an air-conditioning unit is picked which will give 22,340 B.t.u. heating output when supplied with 2-lb. steam and incoming air at 70° D.B.

This same unit has a cooling capacity of slightly greater than 12,882 B.t.u. at 45° F. refrigerant temperature. We also find that at this temperature the ratio of sensible heat to total heat performance is approximately .71.

In picking a refrigerating compressor we again consult equipment performance data for a compressor that has an output of not less than 12,882 B.t.u. at 42° F. refrigerant temperature. The lower compressor temperature is selected in order to overcome pressure drop losses in the refrigerant lines and cooling coil. The selected unit has an air capacity of 420 c.f.m. which will give us approximately 10 changes of air per hour in the room. This is adequate and yet not too great an air volume for this particular application.

Installation of the equipment is the final step. The conditioning unit replaces the radiator and is connected to the same steam lines. A humidistat and thermostat are installed on the opposite wall (See Fig. 1) to provide the necessary automatic control. The unit is equipped with the proper control switch to change from winter to summer operation. The compressor is installed on the floor below and connected with the power and water service.

Further details of installation and adjustment will be discussed in future chapters as we consider other types of air-conditioning applications.

### Conditioning Improves Liquors, Dealer Finds

BOSTON—Charles L. Richardson & Co., first local liquor retailer to adopt air conditioning, has found that it not only benefits the health of employees, but also improves the quality and condition of the wines and liquors themselves, according to the company's president.

High temperatures increase the fermentation of wines and cause them to cloud. With air conditioning, wines on display are kept in better condition and retain their sparkling fresh appearance.

**ARCO COPPER-TO-COPPER**

The fitting is pure Wrought Copper... like the pipe it joins

**SAFE WITH ANY REFRIGERANT**

**NON POROUS**

**FOR AIR CONDITIONING & REFRIGERATION**

**NEEDS NO TINNING**—Arco Copper-to-Copper makes the ideal joint. Safe against leaks of any kind. Safe against vibration. Absolutely non-porous every place in the line. Smooth inside... with Wrought Copper Full Flow Fittings... reduces friction loss. Easier to install, resists corrosion, lasts longer, costs less in the long run. Great variety of fittings from 1/4" to 4".

**ARCO PIPE AND FITTINGS DIVISION**  
**AMERICAN RADIATOR COMPANY**  
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION  
40 West 40th Street, New York, N. Y.

**ARCO**  
Full Flow WROUGHT  
COPPER FITTINGS & PIPE



## York Reports Net Profit of \$165,586 for Year; Medium-Sized Orders Show Increase

YORK, Pa.—The annual statement of York Ice Machinery Corp. released by William S. Shipley, president, shows a net income for the year ending Sept. 30 of \$577,862 before depreciation. Reserves for this purpose amounted to \$412,076, leaving a net profit of \$165,586 after all charges, including reserves for taxes. This compares with a net loss of \$72,216 for the previous year.

A strong current position is reflected in the balance sheet. The corporation is not indebted to banks, and cash alone closely approaches total current liabilities, which amount to \$1,032,425, against current assets of \$7,793,842. Working capital increased approximately \$219,000 during the past fiscal year, while long term debt was reduced by \$189,700.

Orders booked during the year exceeded the previous year by almost 14%. Sales "closed out," which is the basis upon which income is computed for statement purposes, show only a slight increase over last year, with the result that unfilled orders on hand at the end of the fiscal year increase about 44%.

In his letter to stockholders, Mr. Shipley points out two circumstances surrounding the past year's business—there was a larger number of medium-sized orders, and products sold were greatly diversified.

During October and November of the new fiscal year, he adds, orders booked exceeded those of the same period last year by more than 75%, with no large or outstanding orders included.

30 foot throw of air. There is no return from this floor, as the first floor return system takes care of the mezzanine floor as well.

The second and third floors have two rows of ducts running the entire length of the store at the ceiling, with horizontal grilles providing a 50 foot throw. Return ducts at the north wall return the air back to the second floor apparatus room.

Chilled water is supplied to the six spray type dehumidifiers by means of a horizontal single stage double suction centrifugal pump that handles 2,600 g.p.m. from a storage tank in the third basement to the water cooler and to the sprays of the five dehumidifiers in the third basement. A booster pump takes water from this source and supplies it to the second floor dehumidifier.

### STORAGE TANK

The storage tank is large enough to hold the entire quantity of water circulated. In addition to this safety feature, the proper automatic controls are provided for precaution against overflow of the dehumidifier pans. All temperature controls are automatic and of the pneumatic type, operating the pre-heaters and re-heaters as well as the recirculated air and by-pass dampers.

In order to provide air conditioning for the summer of 1936, installation of equipment was hurried to completion. The air-conditioning system covered by the first contract was placed in operation on June 13, and the second system on June 30.

### DESIGN CONDITIONS

In designing this plant, Mr. Leopold established conditions of 80° F. dry bulb and 50% relative humidity inside when the outside conditions are 95° F.

dry bulb and 78° F. wet bulb. The air-conditioning system was given a real test during the summer, not only on account of extreme weather conditions that prevailed in Pittsburgh, but also on account of a large traffic load, resulting from improved business conditions and increased buying activity.

On July 10, the outside weather conditions as recorded by the U. S. weather Bureau reached a peak of 99.6° F. dry bulb temperature and 80.6° F. wet bulb temperature. During these extreme conditions, the refrigerating and air-conditioning system produced the guaranteed requirements with the compressors operating under full load only part of the time.

### BENEFITS OF INSTALLATION

During this first operating season, Gimbel's found their air conditioning not only an asset, but an important factor in department store operation, for the following reasons:

1. Patrons shop in comfort the whole year round, and are especially attracted to the air-conditioned store in summer.
2. The clean, washed air practically eliminates the former losses in soiled garments, mark downs, etc. This is particularly true in the woman's ready-to-wear clothing department.

### FUR SALES INCREASE

3. August sales in furs and fur-trimmed winter coats are now an important percentage of the year's fur business, because people can select and try on the coats in comfort. The fur and winter coat fashion show in August is a feature of the summer season.
4. An air-conditioning system in-

creases the volume of sales during the summer season. During the past summer, the general improvement in business conditions prevented Gimbel's from determining definitely the extent of increased business that could be attributed to air conditioning.

5. The effect of air conditioning on the health as well as sales attitude of employees is valuable and profitable to the store.

## Air-Conditioners Are Installed in Algiers Theaters & Offices

ALGIERS, Algeria—Representatives of American air-conditioning firms have installed several units here, principally in theaters and office buildings, but the total number in use is very small, according to U.S. Consul Edward P. Rand.

The prospective Algerian market is extensive because of the long and intensely hot summer of this district, the consul maintains, and a well-constructed, reliable apparatus of the portable type would win public favor if backed by a competent representative.

The principal obstacle to rapid sales development in this field is that Algeria has been the victim of a five-year depression, the present state of which is extremely serious, says Mr. Rand. Capital has been withdrawn from commerce, and all merchants seem extremely reluctant to assume new obligations, he explains.

Although present conditions seem fairly favorable to recovery, Mr. Rand states, it is impossible to tell just when or in what measure this recovery will be effected.

## — AIR CONDITIONING NEWS —

### Five Floors of Gimbel Store in Pittsburgh Are Air Conditioned; Installation Increases Sales and Cuts Losses

PITTSBURGH—What is said to be the largest year-round air-conditioning system now in operation in Pittsburgh was made last spring in Gimbel Brothers department store here by the local branch of York Ice Machinery Corp.

The installation, which covers the first and second basement and the first three floors of Gimbel's 10-story building, was designed and supervised by Charles Leopold, Philadelphia consulting engineer. G. O. Weddell is manager of York's Pittsburgh office.

In general, the system consists of refrigerating machinery using Freon-12 as a refrigerant, supplying chilled water for several spray type dehumidifiers from which fans circulate the conditioned air through a duct distributing system to the five floors.

### MACHINERY INSTALLED

The refrigerating machinery is located in the third basement and consists of two York vertical single-acting 4-cylinder Freon-12 compressors, each direct-connected to 350-hp. Ideal synchronous motor, developing 356 tons refrigeration under existing operating conditions. Both compressors are provided with 25% and 50% capacity valves on each cylinder, so that every possible variation in the refrigerating load can be taken care of efficiently by hand operation of the necessary capacity reducing valves. With the above valves 56 possible variations in capacity of the refrigerating machines can be obtained, assuring efficient operation under virtually all cooling demands.

### FREON CONDENSERS

The Freon condensers are of the latest York shell-and-copper-finned-tube type, with gas inlet and liquid outlet manifolds of welded construction. Water at 60° F. is supplied from a new well which was drilled in the engine room in a location directly underneath the loading platform at the rear of the building. The well water is handled by a Cook deep well turbine type pump direct-connected to a vertical motor.

The refrigerating machines operate on one shell-and-brass-tube flash type water cooler which is provided with liquid recirculation and automatic float control.

### SPRAY DEHUMIDIFIERS

In the same basement there are five York spray type dehumidifiers, each having a separate fan for supplying conditioned air to the first and second basements, and the first and mezzanine floors. A total of 162,000 c.f.m. of air is handled by the fans.

On the second floor one duplex dehumidifier is provided to supply, by means of separate fans, conditioned air to the second and third floors. A total of 80,000 c.f.m. of air is handled by these two fans.

### DISTRIBUTING SYSTEM

The air-distributing system for the first and second basements consists of a supply duct running along the west wall and three branch ducts running the width of the store at the ceiling, with outlet grilles provided for a 40 foot throw of conditioned air. A return duct runs along the south wall of the store.

The first floor has a supply duct that runs entirely around the store at the ceiling under the mezzanine balcony, with grilles to provide a 70 foot throw. Return grilles are again located along the south wall.

A supply duct for the mezzanine floor runs at the ceiling along the four walls with grilles to provide a



# Important



# ANNOUNCEMENT

to you who appreciate the tremendous profits ahead in AIR CONDITIONING SALES AND SERVICES

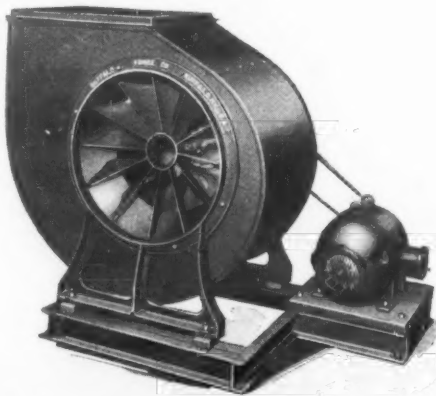
● "Buffalo" offers distributors and contractors much more than mechanical devices for circulating cool air through restaurants, stores, hotels, theaters, and the thousand and one other places interested in conditioned comfort.

We believe that every air-conditioning problem requires its own special solution and our large staff of experienced engineers is ready to assist you in working out the plan best suited to the job at hand.

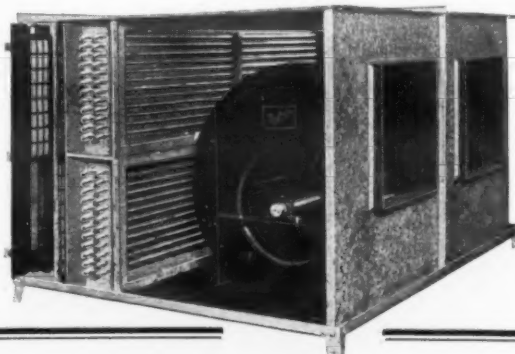
Our experience in building air-conditioning equipment is world-

wide and covers everything from the simple cooling of a small room to the complete air conditioning of some of the largest buildings on the globe.

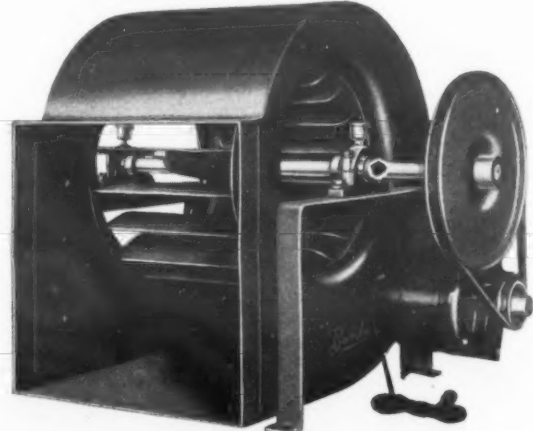
If you want to get into the air conditioning business and avoid the costly mistakes of the uninitiated, if you want equipment that will give unending satisfaction to your customers, if you want the trained staff of a leading manufacturer of air conditioning equipment at your call, then by all means write or wire us now for complete information. New edition of Bulletin 501 now at the printers. Write for your copy.



For the larger job, the QUIET, Buffalo "Limit Load" Fan gives efficient service. Complete range of sizes.



No. 182 Buffalo Central Air Conditioning Cabinet Type PC, with side removed showing fans, cooling coils, filters. Heating coils and humidifiers can also be furnished. Available in capacities from 3 tons up.



Buffalo HVA Fan equipped with one piece motor mountings and motor for quick installation. The ideal fan for air conditioning service.

**BUFFALO FORGE COMPANY**  
487 Broadway Branch Engineering Offices in Principal Cities Buffalo, N. Y.  
In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.





## Hungarian Refrigeration Distributors Handicapped by Stringent Import Restrictions



1. Dr. Paul Szecsi of Arthur Hahn & Co., Frigidaire and Ford (surprising combination) distributor in Budapest, wonders where and when he'll be able to get another Frigidaire to replace the one in his show window, if either of the two prospects gazing at it decided to buy. 2. L. Reichard, Kelvinator distributor, hasn't much left but this sign (and some repossessed models) to indicate he's in the business. 3. Sidewalk ice cream shop in Budapest, harbinger of the opening of a new market for commercial equipment. 4. Patrons of an ice cream shop in Budapest shop take more interest in their reading than in their eating.

## AROUND THE WORLD WITH GEORGE F. TAUBENECK

Proportion of hospitality to refrigeration sales reached a new world's record when the editor arrived in Budapest, glamorous capital of Hungary.

Because of stringent import and monetary restrictions, Budapest refrigerator distributors have been virtually unable to obtain new models for the last two or three years. Nevertheless, these hospitable people practically suspended operations for four days and nights to show Editor Taubeneck the town.

After concluding his observations on the plight of Austria, the editor launches into his discussion of Budapest and Hungary in the current instalment of his "World Series."

Articles of Editor George F. Taubeneck's "Around the World" series appeared in the following issues of the News:

Jan. 8, 1936—Detroit, Mich.; Jan. 15—Jackson, Mich., and Chicago, Ill.; Jan. 22—St. Louis, Mo.; Jan. 29—Claremore and Tulsa, Okla.

Feb. 5—Dallas, Tex.; Feb. 12—El Paso, Tex., and Juarez, Mexico; Feb. 19—Yuma, Globe, and Phoenix, Ariz.; Feb. 26—San Diego, Calif. (also California Pacific Exposition).

March 4—Los Angeles and Hollywood, Calif.; March 11 and 18—San Francisco, Calif.; March 25, April 1 and 8—Honolulu, Hawaii.

April 15—Pago Pago, Samoa, and Suva, Fiji Islands; April 22 and 29—Auckland, New Zealand.

May 6—Melbourne, Australia; May 13 and 20—Sydney, Australia; May 27—Brisbane and Townsville, Australia.

June 3—Shipboard (Sydney to Singapore), and Darwin, North Australia; June 10—Papua and New Guinea, and Soerabaya, Java; June 17—Bandoeng, Batavia, Semarang, Soerabaya, Solo, and Djocja, Java; June 24 and July 1—Singapore, Straits Settlements.

July 8—Penang, Straits Settlements, and Rangoon, Burma; July 15—Calcutta, India; July 22 and 29—Benares, Agra, Delhi, and Bombay, India.

Aug. 5—Suez Canal; Aden, Arabia; and Cairo, Egypt; Aug. 19 and 26—Tel-Aviv, Haifa, Jerusalem, and Jaffa, Palestine.

Sept. 9—Complete text of paper delivered at Seventh International Congress of Refrigeration, The Hague, Holland; Sept. 16 and 23—Colon and Barcelona, Spain, and Marseilles, France; Sept. 30—Malta.

Oct. 7, 14, 21, 28, and Nov. 4—Paris, France (including study of French quota system and survey of the French market).

Nov. 11, 18, and 25—Monte Carlo and Italy; Dec. 2—Rome; Dec. 9—Milan and Venice, Italy; Dec. 16, 23, and 30—Vienna, Austria, and Lichtenstein.

### Austria

An extremely long river, the Danube holds a position in Southern and Central Europe much the same as that of the Mississippi through the Middle West and South of the U. S.

Rising in the southwest corner of Germany, near the French border, the Danube crosses southern Germany, flows across northern Austria through Vienna, cuts over the southwest cor-

ner of Czecho-Slovakia, turns sharply to the South and goes down through Hungary, past Budapest, again turns eastward and traverses Yugoslavia, passing through Belgrade, forms the border between Roumania and Bulgaria, and finally empties into the Black Sea.

Total length of the Danube is 1,725 miles, making it the longest flowing stream in Europe (outside of Russia).

Agriculture is by far the chief occupation of the Austrian people. Yet with

only 20% of the area suitable for cultivation, Austria cannot produce enough food to keep herself fed. She must import a large amount of produce, and, with tariffs as high as they are, this makes food rather expensive.

Principal grains grown in Austria are rye, oats, wheat and barley. Potatoes and turnips are most-grown of other crops. There are many vineyards, and wine-making is a leading occupation, although Austrian wines have not yet acquired the reputation of those from France, Spain, and Italy. Of the livestock, horses, oxen, and beef and dairy cattle are commonest.

Austrian farms are, for the most part, small tracts of land on the sides of hills. Only about five per cent of the land under cultivation is on the plain. The constant toil of carrying loads up and down hills shortens life for the peasant. Though not like "The Man With the Hoe," the Austrian peasant leads a simple, at times almost primitive, life.

It is a custom of the peasant to kill an animal for food at the beginning of the winter, smoke the flesh to preserve it, hang up the carcass, and cut hunks off it from time to time to put in stews, soups and dumplings. Steaks, chops, and other regulation cuts are practically unheard-of luxuries.

### Industries

Well over a third of the land in Austria is covered with thick forests, but the dumping practices of the Russians have caused the virtual demise of Austria's timber trade.

Although her mineral wealth is limited, Austria has rich deposits of anthracite coal and lignite, and she possesses in less quantities copper, zinc, silver and gold ore, lead and salt.

Among the manufacturing industries the leaders are pianos, radios, automobiles, textiles, clothing, jewelry, leather, metal wares and furniture. The blast furnaces of Austria produce an annual output of some 500,000 tons of pig iron.

### Electric Power

With most of her coal deposits taken away from her, Austria began to realize her abundant water power as a source of energy after the war. By 1920, 300 power stations had been built, with a maximum production potential of 1,300,000 kilowatt hours.

Since then, 125 additional large power stations and 10 turbine stations have been completed, increasing the

capacity of production to 3,050,000 kilowatt hours. Hydroelectric power stations now in service supply 40% of the electrical energy required for all purposes in Austria, and the water power resources have barely been tapped.

### Four Rats of Austria

At the last meeting (March, 1933) of the Austrian Parliament which was created immediately following the end of the empire, that legislative body dissolved itself, junking the Constitution of 1920, and with it the Democratic Republic which that constitution had established. In effect, the Democracy of Austria was interred as a failure.

In its place a different type of government was created. Instead of the customary bi-cameral legislature, there is a group of four Rats (no your

Among the trades and professions represented in the Bundeswirtschaftsrat are agriculture and forestry, industry and mining, trade, transport, banking and insurance, and public services.

Austria's eight provinces are Burgenland, Upper Austria, Lower Austria, Tyrol, Styria, Carinthia, Salzburg, and Vorarlberg. Vienna is a separate division, and is represented in the Landerrat by the mayor. Each of the provinces sends its Landeshauptmann to the Landerrat for a term of 10 years.

Legislative procedure is as follows: The four councils of the Federal State meet separately to draft new laws for the regulation of the particular phase of Austrian life which they represent.

Then the Bundestag, made up of 59 men chosen from the four Rats, meets to weigh the merits of laws proposed by the Rats. In this body are 20 members from both the Staatsrat and the Bundeswirtschaftsrat, 10 from the Bundeskulturrat, and nine from the Landerrat.

Austria's president is elected by all the burgomasters of towns throughout the country, meeting as a single body in Vienna. Their selection of a leader is made from a list of three candidates nominated by the Bundesversammlung, or Federal Assembly, composed of all four Rats.

The president, officially titled President of the Federal State of Austria, serves a seven-year term, and his principal duty is to appoint the chancellor, and approve or disapprove of the latter's choice of ministers.

The chancellor is the real head of the government in Austria.

There is a section in the new constitution (the Bundesburger section) which grants to all citizens of Austria equality in the eyes of the law, and which bestows on women citizens the same rights and duties as men unless, as in certain matters, there is a statute to the contrary.

### Geographical Features

Before the war, Austria covered an area of 115,900 square miles. Today, the area of the country is but little more than a fifth of that size, having been reduced to 32,360 square miles. Approximately three-fourths of the land consists of hills and mountains, mostly offshoots and foothills of the Eastern Alps.

Because of her inland position and the striking irregularities of her surface, Austria has a greatly diversified (Concluded on Page 17, Column 1)

### Outlanders



Hungarian girl and child of the "Matyo" strain, which produces some of Europe's loveliest faces.

eyes don't deceive you), or councils, which meet on occasion as the Bundestag to decide on proposed laws, and which more rarely convene as the Bundesversammlung, or Federal Assembly.

Austria's four Rats are the Staatsrat, or State Council, with 40 to 50 members; the Bundeskulturrat, with 30 to 40 members, which deals with religious and secular education, science, and art; the Bundeswirtschaftsrat, with 70 to 80 members representing the trades and professions; and the Landerrat, which represents home rule in each of the eight provinces of the country.

## Glamorous Budapest, Queen of the Danube, Is Arrayed in Bright Architectural Jewels



1. From the Buda side of Budapest, one gets this fine view of the city and the Danube. In the left foreground is the statue and memorial of St. Gellert, the historical hero and patron of Budapest. 2. Tomb of the Unknown Soldier in Budapest. Between each set of columns in the colonnade which extends on each side of the memorial (a portion of one side shows in the picture) is a statue of one of the great Hungarian kings. 3. The Danube at night, as it flows through bright Budapest.



## AROUND THE WORLD WITH GEORGE F. TAUBENECK

(Concluded from Page 16, Column 5)  
climate. In the higher altitudes, the climate tends to be almost Arctic. The rest of the country has that unstable climate so common in Europe, with rain, sun, mist, fog, brooding clouds, sunny skies, heat, and chills all in a mad scramble for dominance.

Rainfall, which is plentiful enough for agricultural purposes, decreases in volume toward the east. In Vienna the mean annual temperature is 48.8°.

Unfortunately, the "Beautiful Blue Danube" was azure only in the lyric mind of Johann Strauss the younger. In cold reality, the Danube is a depressing gray as it flows through Vienna. Its bed is of soft clay and mud which, being in a perpetual state of turmoil, impart to the water its own somber color.

### Budapest

Budapest is my favorite of all cities of Europe—at night.

By day, save for an occasional oasis like the chastely elegant St. Gellert hotel, Budapest is a bit crummy. It's obviously poor, and carelessly bedraggled.

But at night—ah! New York can have its Times Square, London its Piccadilly, Paris its Champs Elysees. I'll take that gay sector of Budapest through which the Danube flows so majestically, and along the banks of which life streams by in gay accord.

That carelessness which leaves rubbish and grime to show in daylight contributes at night to the making of the happiest, most light-hearted and good-natured nocturnal population to be found on the streets of any city in the world.

From an endless series of sidewalk cafes sweeps out the pizzicato and allegretto of Hungarian *czardas* music, the true gypsy rhythm, than which there is no music so soul-penetrating.

And while your ears are assuaged with the stringed tonal adventures of the little gypsy bands, your eyes are treated to the floodlighted glories of the St. Gellert memorial, Fisherman's Bastion, and other fairy castles embossed on the high slopes of Pesth.

Pesth? Yes, Budapest is really two cities. Buda and Pesth. The latter is the old city, and is built on an eminence which drops rather sharply down to the Danube.

The Danube itself glows with the phosphorescence of lights reflected from the cafes and tony hotels which line the banks on the Buda side. But it's the whitened jewels beaming from the altitudinous Pesth which make the visitor say: "Ah! Here is the most beautiful city of them all!"

### 1931 Kelvinators— 1941 Night Life

First refrigeration distributor I called on was L. Reichard, who has the Kelvinator agency. When I got there he was dusting off two of the three repossessed 1931 Kelvinators he had on display. Import restrictions prevent him from bringing new models into the country.

But, say! Wouldn't I come upstairs and meet the wife? And stay for luncheon. How about doing the town tonight? I would, and did. And Mr. Reichard, his pretty wife, and their friends turned out to be as charming and pleasant as anyone I'd met on the trip.

The Reichards and their witty, cultured companions took me on a two-night tour of the restaurants and night clubs—and such a gay time we had!

The clubs, notably the Arizona, are as striking and original in decor as any you'll see in New York or Paris, and the entertainment is tip-top.

Hungarians say, laughingly, that one of their chief exports is cabaret dancers; and certainly anyone who has seen them in their native haunts would testify as to the excellent quality of the product.

The gypsy music, of course, is unparalleled. Most of it is *ad lib*, with the violin-playing leader fathoming the moods of his listeners, and improvising melodies and rhythms to match.

We went from place to place on this amusement tour in street cars. Budapest residents have no money for automobiles, which are priced—because of tariffs—prohibitively high.

Your life is safer on Budapest's streets than in almost any city you can name. Sometimes you walk for three or four blocks without seeing an automobile.

But they have a lot of fun in their beautiful Budapest, these Hungarians. A little wine, dark and striking women, a lot of music, and a rich architectural heritage of the centuries combine with the naturally gay people to make Budapest so brilliant you'll never forget it, and always recall it with pleasure and a lift of the spirits.

Curiously enough, one of the most popular numbers with Hungarian cafe and night club orchestras is the old, American pre-jazz favorite, "Wabash Blues!"

What a funny world this is—at home on the Wabash river, where I was born, the "Blue Danube" waltz is a great favorite; on the Danube, it was the "Wabash Blues."

Another curious and arresting thing I noticed about Budapest was the advertising methods used by the barber shops. Instead of the striped poles we see in America, the shops display pictures of their pretty girl attendants in burlesque house fashion.

Inside the shops, the girls are available for manures, pedicures—and they always lather your face when you get a shave. It was nice work, and reminded me of nothing so much as the pretty dentist's assistant, who holds your jaws open when you're having a tooth drilled.

Hungary itself is not large enough to supply Budapest's industrial plants with the necessary raw materials. As a result, most of this must be imported, which gives the country a perpetually unfavorable balance of trade.

"It's very difficult for a merchant in Budapest," most of those engaged in that business will tell you, readily enough. Income taxes are very high. A sales tax on all goods sold is imposed at the factory, and the merchants are burdened with that from the moment the merchandise reaches their shelves. Then there is a luxury tax, and (as though that were not enough) a rent tax which amounts, in some cases, to almost 50%.

The food you buy in Budapest is good, wholesome—and heavy. Much cream is used in its preparation, and the chefs go heavily for sweetstuffs. If a resident of Budapest has but one tooth in his head, it's a safe bet that it's a sweet one.

### 2000 Units in Use

I had some trouble convincing Dr. Paul Szecsi, manager of Arthur Hahn & Co., Frigidaire representative in Budapest, that I was really the man who was making the trip around the world for the News.

"You wrote those long articles?" he asked, unbelievably.

He had a stack of copies of the News on his desk almost a foot high. And he was more than glad to talk about the refrigeration market in Hungary. Together with the helpful Mr. Reichard, he supplied the information which follows.

Hahn & Co., in addition to handling Frigidaire, also has the Ford agency for Budapest and Hungary. Which situation is a little unusual, to say the least: Ford and General Motors under the same roof.

There are less than 2,000 mechanical refrigeration units in use today in all of Hungary—in fact, American-made machines in use number only about 1,000, I was informed. Only United States manufacturers represented in the country are Frigidaire and Kelvinator. Of the 1,000, it is estimated that about 700 are Frigidaires, and 150 Kelvinators. Electrolux, according to reports, has sold about 50, and Linde (the German company) about 20 or so, although the company does not now sell domestic units in the country.

Getting Frigidaires into the country, Mr. Szecsi told me, is a complicated, now-you-have-it-now-you-don't procedure. First the dealer applies for an import permit, making his attempts by a devious route. Then, even after he gets one, there's only a faint chance that the request will be granted.

The few permits the company has been able to obtain were for replacement parts. Most of these were pur-

chased through the Harry Alter Co., Chicago.

To complicate further matters, payment for the parts cannot be made in American dollars. Companies can pay, however, in German currency, because of the trade agreement between the two countries and the exports Hungary makes to that country—pigs, legumes, bacon, and other materials.

As Mr. Szecsi explained it, Hungary has been chiefly a food-producing country. In the last 10 years, however, its industrial development has come, and the country hasn't been able to get ready for it.

Textiles, glass (for export to America), sugar, white flour, shoes, furniture, guns, Diesel cars for railways (exported to the Argentine), radio tubes, and electric lamps (known as Tungstram) are manufactured at present—and, as previously mentioned, most of the materials have to be brought in from other countries.

Refrigerator factories, of which there are several in the country, all make less than 100 units per year, Mr. Szecsi said—most of them less than 50—and they are all hand made machines, built to order for individual purchasers. The high resultant price hasn't done much to popularize mechanical refrigeration in Hungary, despite the fact that the commercial price of 210 pounds of ice is about 161.80 pengoes, delivered. The pengo is worth about \$0.2961, per value.

In addition to American machines, the chief manufacturers operating in Budapest are German—Bosch, DKW, and Linde, although the latter makes no household machines. Electrolux, the gas refrigerator, is another competitor.

No air conditioning has found its way into commercial use in Budapest. A couple of engineers have installed

systems for use in their own laboratories, but purely as experiments and with no evident intentions of striking out for a larger market.

In Budapest, electric current is distributed by a municipal company; in the provinces, distribution is in the hands of privately owned companies. Budapest has a special rate for electric refrigerators: .18 pengoes, about 3½ cents, per kwh. up to 5 kwh.; and .07 pengoes, about 1½ cents, for more than that amount. The regular electric light rate is .52 pengo per kwh.

Production of electric current in the country has increased a few per cent during the last two years. This increase, however, has been due entirely to the increased consumption on the part of industry, as domestic consumption has remained practically unchanged.

Contrary to the custom in most countries, the cost of current increases with the amount consumed. Until recently, this was true both in Budapest and the provinces; recent reductions in Budapest, however, have made current for household appliances (refrigerators, vacuum cleaners, and electric irons) cheaper, although it is of the same voltage as that used for lighting purposes.

In selling electric refrigerators, Mr. Szecsi employs "spotters," who are working regularly at other jobs, to ferret out prospects for him on a commission basis. There is no such thing as a regular salesman—business is not good enough to support one.

Rebuilt American machines sell for about the same prices as do new Hungarian models; for instance, I noticed a 5-cu. ft. rebuilt Kelvinator and a new locally made unit, each priced at 900 pengoes, about \$180 in American currency.

Because of the difficulty of obtaining complete machines, Frigidaire last year imported the refrigerating units, and made its own cabinets, Mr. Szecsi told me. The complete job sold, when assembled for about 1,500 pengoes, about \$300. He admits it wasn't so good, because the cabinets were not well made. They had porcelain interiors, Dulux exteriors.

The largest field for business at present, Mr. Reichard says, is service. Kelvinator sales during 1936 had been discouraging—only about five units—because of the low purchasing power of the average Hungarian.

Budapest dominates the Hungarian radio market, all models being manufactured by agencies in the city. Smaller models, using from two to four tubes, are the most popular. Selling prices of these models range around 450 pengoes. Electrolux is on the market in Budapest with a vacuum cleaner.

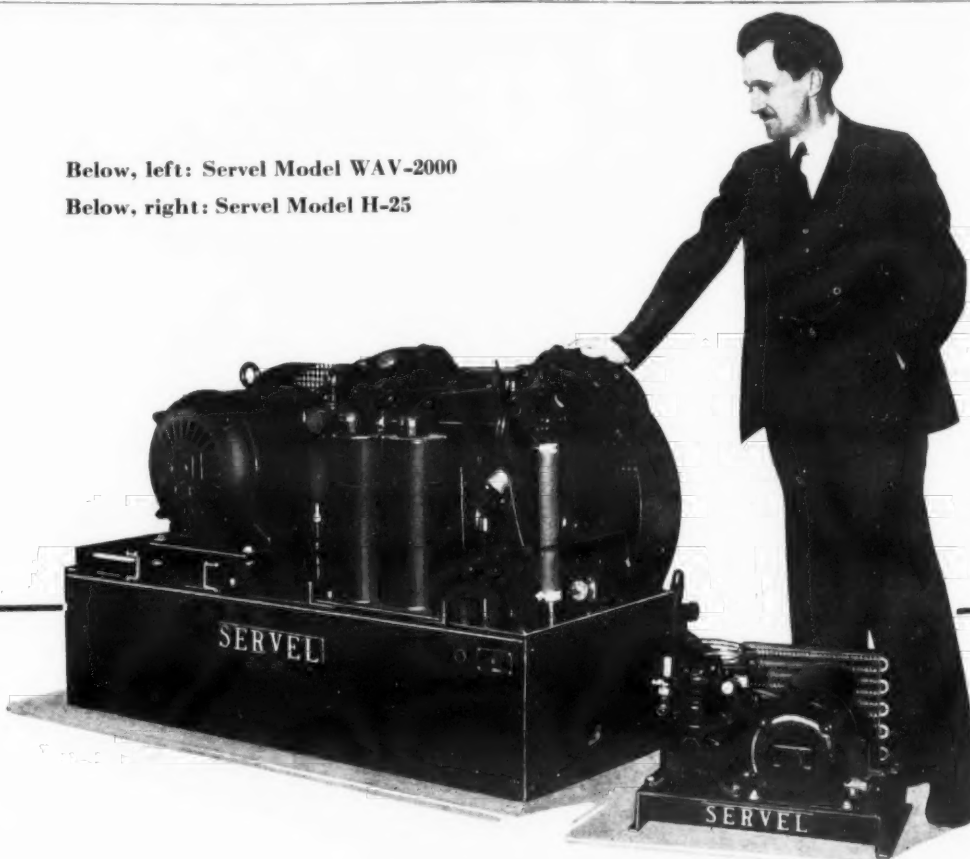
The electric range industry is beginning to be developed here on a small scale, and three or four companies are producing models, I was told. The recent special appliance rates should prove advantageous to the new industry, it was felt.

At present, most of the country cooks with coal gas or coal. Gas, in Budapest, was about one-fifth pengo per cubic foot—about 5 cents, in American money.

There is fair market for commercial refrigeration equipment in Budapest's meat markets, restaurants, and confectioners; several ice cream cabinet sales have been made recently to merchants of the latter class. Water cooler installations, however, have been sparse—the number in use in the city was estimated at a dozen, two Kelvinators and 10 Frigidaires.

Below, left: Servel Model WAV-2000

Below, right: Servel Model H-25



Speaking of equations . . .

# V=200H

THAT'S an engineer's way of saying that Servel's big 20-ton unit is equivalent in cooling capacity to two hundred of its baby sister (shown beside it in the above picture).

Servel's complete line covers the entire field of commercial refrigeration and air conditioning. Over 40 practical, merchandisable models—each reflecting fifteen years' experience in the designing and building of dependable low-pressure equipment—each meeting a definite demand.

Take the "X" out of your profit equation by selling Servel products. Good engineering, intelligent merchandising and careful installation deserve the added assurance of proven performance in your compressor equipment.

In addition to standard models, Servel produces many special refrigerating machines for manufacturers of specialized fixtures. Our engineering staff will gladly assist in working out unusual problems.

SERVEL, INC. Electric Refrigeration and Air Conditioning Division, EVANSVILLE, IND.

## SERVEL

COMMERCIAL REFRIGERATION  
AND AIR CONDITIONING



A FEATURE of the recent conference held by the Westinghouse air-conditioning department was a symposium in which four of the firm's most successful air-conditioning distributors described their organizations, and some of the sales methods which they have found successful.

Since expressions of opinions from sales executives in the industry indicate that distributor organizations and retail selling methods are major problems facing air conditioning, these reports by men active in the field will, the editors feel, be of high interest and value to readers of the NEWS.

## — SELLING AIR CONDITIONING —

### Natkin Traces Sale of Large Conditioning Installation to Kansas City Bank For Westinghouse Distributors

MANSFIELD—The toughest job that Natkin & Co., Kansas City Westinghouse distributor, closed this year also proved to be the largest year-round installation the company ever made, Ben Natkin, president of the company, told Westinghouse air-conditioning distributors at their recent annual meeting here.

"The prospect was a 10-story office building in a middle western city of 100,000 population, owned by a bank that occupies the first floor and basement," Mr. Natkin said. "The building was about 25 years old and consisted of 210 office rooms in addition to the banking quarters, requiring about 150 tons of refrigeration."

"This building had a building manager who recognized the fact that if the building were to continue to be a revenue producer, he must keep it modernized and a step ahead of his competitors in the older buildings, and in line with new building construction. After installing new high speed elevators a few years ago, he concluded that the next step would be to air condition the building, as he felt that the trend of time called for this improvement."

"With this conclusion, he wanted his building to be the first in the field, and, thereby 'Get the jump' on his competitors."

#### TENANTS AGREEABLE

"He made a survey of the tenants of the building to see what percentage would be agreeable to pay an increased rental of approximately 20 cents a foot per year (which was the operating and owning cost of the air-conditioning system) and found that a large majority were favorable. He then approached the bank owners for an appropriation to do this work. In this, he only partially succeeded, but got permission to obtain estimates and a promise of further consideration. His next step was to request designs and bids from several prominent air-conditioning firms."

"After making a preliminary study and investigation of the problem, we sat down and analyzed the hurdles we would have to overcome to land this contract. They were as follows:

"The type of personage we had to deal with—the building manager with his architect and engineers who required technical and engineering presentation; and the bankers who were not engineers and would only look at the proposition from a safe and profitable investment angle."

"The operating engineer, (who was

of the old school), was definitely set on using one or two large compressors instead of the multiple system that we intended to propose."

"We realized that if we were able to sell the building manager and engineer on our proposition, there would still remain the great problem of 'selling' the bankers, who were lukewarm toward spending this large sum of money."

"The next hurdle was to prove to the owners and their engineers that we were fully capable of handling their installation, and that we had a design superior to that of any of the other bidders."

#### PRICE PLACED LAST

"Last, but not least, was to be able to make a price in line with our competitors and yet leave a fair profit for ourselves."

"While we listed 'price' as the last item, we realized that it naturally would be one of the important deciding factors. On the other hand, we were convinced that price would be the last factor, and not the first, as it is in so many other cases."

"Here were prospective buyers who had plenty of finances at their command, and who we felt would not stop in spending what was required, if it could be proven to them that they were getting all that they were paying for. We realized that in purchasing this plant, the bankers were considering it somewhat of an experiment, and were going to be extremely cautious and feel absolutely safe before putting their name on the dotted line."

"Our first job, therefore, was to sell ourselves to the building manager and his architect and engineer. We used every one of these means to further our end. We endeavored to impress them with our many years of successful engineering in heating, ventilating and air conditioning in this particular territory, showing them long lists of successful installations. We got our own bankers to write to our prospect."

#### PLANS FOR ENGINEER

"The foregoing efforts were made to sell ourselves to the bankers. For the building manager, and the engineers, it was necessary to prepare a fine set of drawings, together with an analysis of operation, engineering."

"Although their minds had been prejudiced by our competitors for a single compressor job, we succeeded in selling them on the fine points of

a multiple installation, multiple zone controls, ease of operation, perfect temperature and humidity control; and the fact that our plant could be operated by their usual mechanics, eliminating the necessity for high priced engineers. It took many meetings and many discussions to get these points across; but we finally succeeded in convincing them that we had designed the type of plant that they needed."

"When they were sold on our distribution system throughout the building, they requested of us to give them a revised bid, using a central compressor, but leaving the balance of our design remain the same. While we were in position to give them such a bid, we refused to do so, and stood 'pat' on our multiple compressor installation."

"Later, they told us that it was our steadfastness in standing by what we felt was correct engineering, even though we took a chance of losing the contract, that went a long way toward effecting their decision to award us this job. In fact, they told us that we were the only firm that seemed to know what it was all about and stood by its position, while our competition stood ready to modify their propositions to fit any reasonable suggestion that the building manager put forth."

"From the very beginning to the end, our price was out of line with our competition; and when we were asked to cut, we refused; arguing that our price was low for the class of equipment and type of design that we were furnishing. We proved to them that while our price might be higher, we could show operating economies that would more than offset our additional price; and also that the excess amount would be made up in but a short time through savings in electricity and water."

"All the above discussions can be summed up in one word—'confidence.' If you cannot convince your prospect that you know your business better than your competitor, and that you have the best product on the market, your chances of selling the job are mighty small."

"All you really have left to talk about is 'price,' which means that to get the business you must make a price that will overcome the confidence that possibly your competitors have created in the minds of the purchaser. Once you gain this confidence, the purchaser will work with you in a position to take almost any hurdle that is put up by your competitors."

"As a final word, do not forget that after you have sold the job, you should not leave it until it is working 100% perfect, and the purchaser is 100% satisfied."

## Designing, Selling, & Servicing Talents Needed to Make Engineering Firm Successful, Reding Declares

MANSFIELD—Air conditioning is primarily an engineering business, but specialized talents for designing, selling, servicing, and management must also be included if a company expects to realize its full possibilities in the field, H. W. Reding, manager of the air-conditioning department of Danforth Co., Pittsburgh, told Westinghouse air-conditioning distributors during their recent convention.

In his address, titled "Organized for Business," Mr. Reding outlined what he considered the business essentials necessary for the successful conduct of an air-conditioning dealership.

"An editorial in a recent trade paper makes some very pertinent comment on the type of air conditioning dealer organization which can be successful," Mr. Reding began. "This editorial points out that the sale of air conditioning equipment has been generally, very disappointing. There has been no lack of engineering study and development; promotional activity has succeeded in interesting the public generally; the idea of air conditioning is well understood and is broadly accepted. Still sales are too small."

#### GOOD DEALERS SCARCE

"The reason assigned is the scarcity of dealers who have all that it takes to sell air conditioning. Some dealers have the engineering and construction talent and lack aggressive selling; others have the selling ability but do not have the engineering and construction. Success is certain only when there is experienced engineering and construction talent and forceful selling coupled with sound business management."

"It is the purpose of this brief discussion to outline a type of organization that could and should fulfill the general specification suggested in the editorial."

"It is easy and obvious to divide the organization into five classifications: engineering, selling, construction, service, and management. These functions certainly must be found in any organization, but whether each is represented by a complete department depends, of course, upon the volume of business and other peculiarly local conditions."

#### ENGINEERING FOUNDATION

"The engineering department prepares, designs and makes estimates for the sales department. The work of this department is the foundation upon which the whole business rests. Designs and estimates must be good if jobs are to be sold."

"An ideal man for this work is one who has a firm technical foundation engineering ability and experience. A great deal of practical air-conditioning engineering requires no reference to basic theory and mathematical analysis but when the unusual problem arises, as it frequently does, the answer is surer and safer if worked out by a combination of technical and practical ability. A technical background is good form of insurance against costly mistakes."

#### QUALIFICATIONS

"The list of requirements for a good application engineer could be almost endless. Certainly the qualities of imagination and resourcefulness come near the top of the list. He should carry in his mental stock information regarding the characteristics of machinery and equipment and costs."

"The quality of an application engineer is perhaps best shown in connection with a survey. We will naturally obtain information as to dimensions, occupancy, sun and load conditions but this is just the starting point for a good survey. Experience, supplemented perhaps by some brief calculations will determine the load and air volume approximately. This gives an approximation of the equipment and ducts required."

"What layout of ducts and equipment will most economically accomplish the desired good result? All of this can and should be approximated right on the job. It will be carefully checked later, but the habit of making a mental design at the time of the survey means a good and complete survey and much time saved after return to the office."

"With a design and a proposal prepared the job must be sold. What does it take to sell it? Of course any salesman should have certain recognized sales characteristics, such

as good appearance, pleasing manner, tact and judgement. These are valuable but secondary."

"There may be somewhere a salesman who can successfully sell air-conditioning jobs by means of personality and appearance, but the salesman who knows air conditioning, who knows the details of the job he is trying to sell and has the faculty of creating in the prospective customer's mind a feeling of confidence; this man is a 'sure bet' as an air-conditioning salesman."

"On many competitive jobs the information and recommendations of one bidder will differ materially from that given by his competitor. The ideal salesman is the one who can submit his proposal after the customer believes that at last he has the solution to all his difficulties."

#### SALES COOPERATION

"This means, of course, that the salesman must be an engineer and must work with the designer so that by the time the proposal is ready he knows what is included and why."

"Let us assume a happy ending of our negotiation, in other words, a signed proposal. There is now more engineering to do. The installation engineer must take over the job, comprehend the design as sold and then work out all the details, many of which have been checked but not worked out by the designer."

"In other words, he, too, must be an air-conditioning engineer. He must be a good purchasing agent, must be a good man in managing labor and in the busy season, must have a fine disregard for regular working hours."

"All of these are essential, but there is one more essential—the lack of which is fatal. That is determination—the ability to get the job installed as promised in spite of a thousand reasons why it should be delayed. Completion promises should be made with care and consideration and with the help of the construction department but once made they should be kept—to the letter."

#### SERVICE SETUP

"It is trite, but true, that service can make or break any air-conditioning dealer. A good service man must combine the qualities of an engineer, a diplomat and a judge. As an engineer he can discover and remedy a difficulty. As a diplomat he can straighten ruffled feathers and create good will for his company. As a judge he can view a situation honestly and make a just decision regarding allocation of charges in case there is a question as to whether the customer or the dealer should pay. Above all promptness is required."

"It may be questioned whether the manager of an air-conditioning business need be also an engineer. Unquestionably there are successful managers who are not engineers. It seems, however, that the probability of success is greater if he is an engineer. There are matters of engineering policy to decide. On many jobs there are close engineering decisions which have an important bearing on the success or the cost of the job. Such questions should be finally decided by the manager. It leaves full responsibility where it belongs. An engineering understanding will surely be of assistance."

#### OTHER QUALITIES

"Let it not be thought, however, that engineering knowledge is all that is required. There must be a proper measure of ability for sales management and promotion. The maintenance of a sound pricing policy is perhaps the most difficult and important duty which a manager faces. Here an engineering understanding is of particular value. Is the cost high or low for the particular job? A sound idea as the answer to this question leads to good competitive bidding."

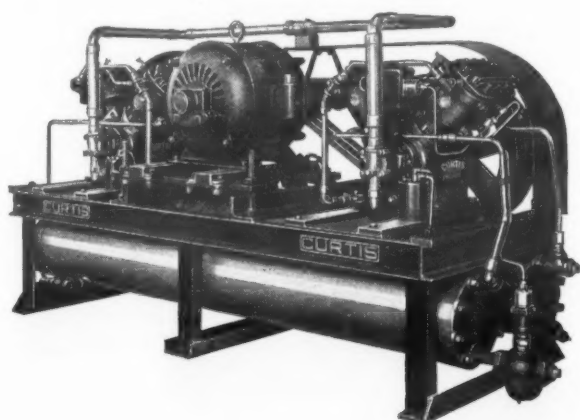
"There is little doubt that a general air-conditioning business is an engineering business. An organization must consist of engineers but there must be additional specialized talents for designing, selling, installing, servicing and management."

"The ideal combinations are not easy to find. The dealer so fortunate as to have the required specialized engineering talent and a sufficient working capital may be said to be truly organized for business," Mr. Reding concluded.

AGE ISN'T ALL  
... but Experience  
is mighty important

BEHIND every Curtis condensing unit stands thirteen years of continuous development, 42 years of experience in making fine compressors, and an engineering and manufacturing background that dates back 82 years to 1854.

Age alone isn't enough, but Curtis' Experience means a great deal today. It means that Curtis condensing units and refrigerating equipment



are carefully and soundly designed—that Curtis standards are the highest in the industry.

Investigate the performance of Curtis products, and you'll see that experience counts a lot.

# CURTIS

CURTIS REFRIGERATING MACHINE CO.  
Division of Curtis Manufacturing Co.  
1912 Kienlen Avenue - - - Saint Louis, Missouri



## They Flew to the Convention



If the speed with which they traveled to and from the recent Leonard convention is any indication, members of the sales staff of L. C. Wiswell & Co., Chicago distributor, really are going places this year. This delegation of 17 made the trip from Chicago to Detroit in one hour and 27 minutes. Mr. Wiswell is second from left in the front row.

## Latest Practices In Planned Kitchen Design Outlined by Home Furnishing Authority

By Mary Davis Gillies\*, Home Furnishing Editor, McCall's Magazine

The Little Woman in the Home has become the national Prima Donna. Manufacturers and retailers hang on her every word and wish. What she wants, sells. What she does not want, does not sell. Is it any wonder endless effort is taken to pry into her thought?

On *McCall's Magazine* we sit by her side and hold her hand all the time. First we visit her—thousands of her—and find out what she is interested in. Then we return to her, with the magazine under our arm, and find out if we gave her what she wanted. As a result we think we know women.

Now what are some of the questions which come up in the attitude of the little woman to kitchens? With movies, bridge and other activities to take up her time, is she still interested in kitchens? Is she more interested in a new range or a new refrigerator than in her kitchen as a whole? Are women conscious that there are efficient, time-saving kitchens?

Incidentally, let me ask you—do you yourself know how a kitchen should be arranged? And finally, have you ever thought about the response the little woman in the home gives to the super-glamorous, cabaret-style display kitchens featured during the last few years?

### HERE'S THE ANSWERS

Let's sketch over the answer to those questions briefly. We have every reason to believe that women are as interested in kitchens as they ever were. A check of letters from our readers shows that there are more requests for information on living rooms and kitchens than on any other rooms in the house. In answer to the question on our reader survey—"If you could do over one room in your house, which would it be?"—it's evident that kitchens will be second on the list. In the groups of houses at the Chicago Fair, there were more comments on the kitchens, venetian blinds, and twin beds than on any other features in the house.

We also have reason to believe that women are more interested in their kitchens as a whole than they are in individual appliances. For instance, articles dealing with kitchen planning and showing an attractive kitchen have a higher attention rating and reading than straight equipment articles.

Second, at home shows the country over, model kitchens have a larger attendance than booths displaying equipment.

Third, a count on coupon returns from advertisements in consumer magazines featuring complete kitchens shows a higher return than the showing of only refrigerator or range advertisements.

### KITCHEN ENTHUSIASM

You may say "It's all right for you on *McCall's Magazine* to be interested in kitchens. All you want is to interest women. But we want to build a load and in some cases, to sell equipment." This brings to my mind a statement made by that arch-merchandise Kenneth Collins—"Don't spend money advertising what people don't want. Put your money behind what people do want." It's self-evident that the way to sell women appliances is through enthusiasm for modern kitchens.

It's comforting to know that you will not have to hoe this row of kitchen modernization alone. If I were poetic I would say that the time for the harvest was at hand. The

\*Address given before the Public Utilities Advertising Association.

ground has been prepared. Women know that there have been new developments in kitchen equipment planning. A partial checkup in the industry of what is being done to popularize modern kitchens is amazing. The Edison Electric Institute and The National Electrical Manufacturers Association have organized the kitchen promotion program this year. They have just published a book on kitchen planning which is the last word in the field.

The American Gas Association has an advertising and publicity program aimed in the same direction and they are revising their Kitchen Planning Manual, which is already a classic.

### MANUFACTURERS' PROGRAMS

The General Electric Co. is behind a building program promoting planned kitchens as an essential part of New American homes, to be built all over the country. Kelvinator is building 150 houses in different parts of the country which include completely equipped kitchens.

Westinghouse and its Mr. Clark are leaders in clarifying kitchen thinking. Electrolux has instituted a kitchen planning organization. Even the plumbing companies with only their sinks to feature are putting their bit into kitchen promotion. In fact, practically every manufacturer distributing major kitchen appliances today has an active program for promoting complete modern kitchens.

In addition to this, "The Courage of Kay" and four other kitchen planning movies are going the rounds of the country. It has been estimated that this year alone millions of women have been exposed to this appealing sort of selling campaign.

Right here I want to tell you how terribly simple kitchen planning is. Just because you haven't a kitchen expert sitting at the next desk, never for a minute stay out of kitchen planning. Anyone can learn the simple rules in a short time, because all the authorities have put their heads together and have agreed on certain fundamentals that eliminate confusion.

### CENTERS OF OPERATION

Briefly, these are the facts: In the home kitchen there are three centers of operation. Those are:

1. The refrigerator—preparation center.
2. The sink—dishwashing center.
3. The range—serving center.

Each of these centers can stand as a complete unit in itself but their relationship is important in saving steps and obtaining greater efficiency.

The refrigerator-preparation center should consist of a refrigerator and a preparation counter with cabinets above and below, thus correlating all food storage and food preparation. I'm sure you have all been in kitchens where the refrigerator was in the back entry or off on a wall by itself—miles away from the work counter.

Never let the refrigerator stray from the preparation counter, because all kitchen studies prove that this particular combination of units saves more steps than any other you can make. And another point, since food delicacies all come in at the back door the refrigerator-preparation center should be placed near that door so that the eggs, oranges, and vegetables can be tucked away immediately.

### CLEANING UP

Next to the refrigerator-preparation center should be the sink-dishwashing center, because water is necessary in

the preparation of food. Moreover it goes without saying that an amazing number of utensils are soiled in the preparation of a meal. And it is grand to be able to dump them right into the sink. At the sink-dishwashing center should be stored soap, cleaning powders, towels, paring knives and the collection of gadgets now used in tricking up fruits and vegetables. If possible there should also be storage cupboards close at hand for glassware and china.

Finally, as you move around the kitchen, there is the range-service center, which logically should be placed between the sink and the dining room door so that food can be taken from the range to serve and then can sail right into the dining room. And the soiled pots and pans can go in the other direction into the sink.

At this range-service center should be stored pots and pans and serving dishes.

### SHAPE OF THE KITCHEN

In the ideal kitchen these three centers are all linked together with the cabinets which may take a "U" or an "L" shaped form.

In the "U" form the refrigerator-preparation unit is on the side nearest the back door. The sink-dishwasher center is at the dead end of the "U" under a window. The range-serving center is opposite the refrigerator next to the dining room door.

In the "L" plan the same sequences follow and the fourth corner of the kitchen becomes either a planning or an eating center.

In order to get all this equipment into a kitchen at least 8x12 feet are necessary. When more than one person works in the kitchen, a room 10x14 feet, or even 14x16, is desirable. In a kitchen of the last size it is possible to include an eating center and even a planning center with books, recipe files, etc. These are two very desirable units.

In the too small kitchen, storage space is apt to be sacrificed and that's unfortunate. It is a good rule to allow 6 square feet of upper cabinets for each member of the family plus 12 square feet for guests. Thus in a three bedroom house if you allow 2 persons for the master's bedroom and 1 person for each of the other rooms you will need 4x6 feet or 24 square feet of upper cabinets plus an additional 12 square feet for guests or 36 square feet in all. If this ratio of upper cabinets is provided the lower storage space will be ample.

### SALESMAN SHOULD KNOW

I do not mean to suggest that the promotion and sale of individual ranges and refrigerators should cease. But I do feel that every salesman should be thoroughly conversant with the generally accepted principles of kitchen planning.

Moreover, in the sale of each piece of equipment he should present a sketch of how the customer's kitchen should be arranged and how it would look if it were completely modernized. He should take care to see that the equipment sold is installed in the right place in the kitchen. At present, nine times out of ten it isn't.

The salesman should also have a few kitchen color schemes in his pocket just to intrigue the little woman. It's the psychological time to make such a presentation, because the new range or refrigerator is bound to make the rest of her kitchen look shabby. If the modernization idea is properly planted and a kitchen plan book or sketch left in her hands, another equipment sale is apt to be made in a short time in order to complete the kitchen.

### ARCHITECTS' AID VITAL

I also think it is vital to get in touch with the builders and architects in your community to insure well planned kitchens in the new houses of your district.

We have been collecting plans from builders all over the country this year and as yet, only one plan that has crossed my desk has had a well arranged kitchen. It happened to be a house from the Munsey Park Development in Long Island.

I asked Mr. Naughton, representing the company, how it happened that he had this perfect kitchen, and he explained that a Kitchen Planning Bureau had done the job for him. Mr. Naughton went on to explain that he felt that a well equipped bathroom and kitchen were the best salesmen a house could have. In fact, in their real estate office they have constructed complete model kitchen and bathroom with all units connected!

Incidentally, a lot of display kitchens I've seen don't look like kitchens women could actually visualize themselves baking a cake in. You know the women of your community. You know what they want. So don't be buffaloed into setting up two thousand dollar streamlined stage set kitchens unless you happen to be in Hollywood.

### DON'T BE HIGH HAT

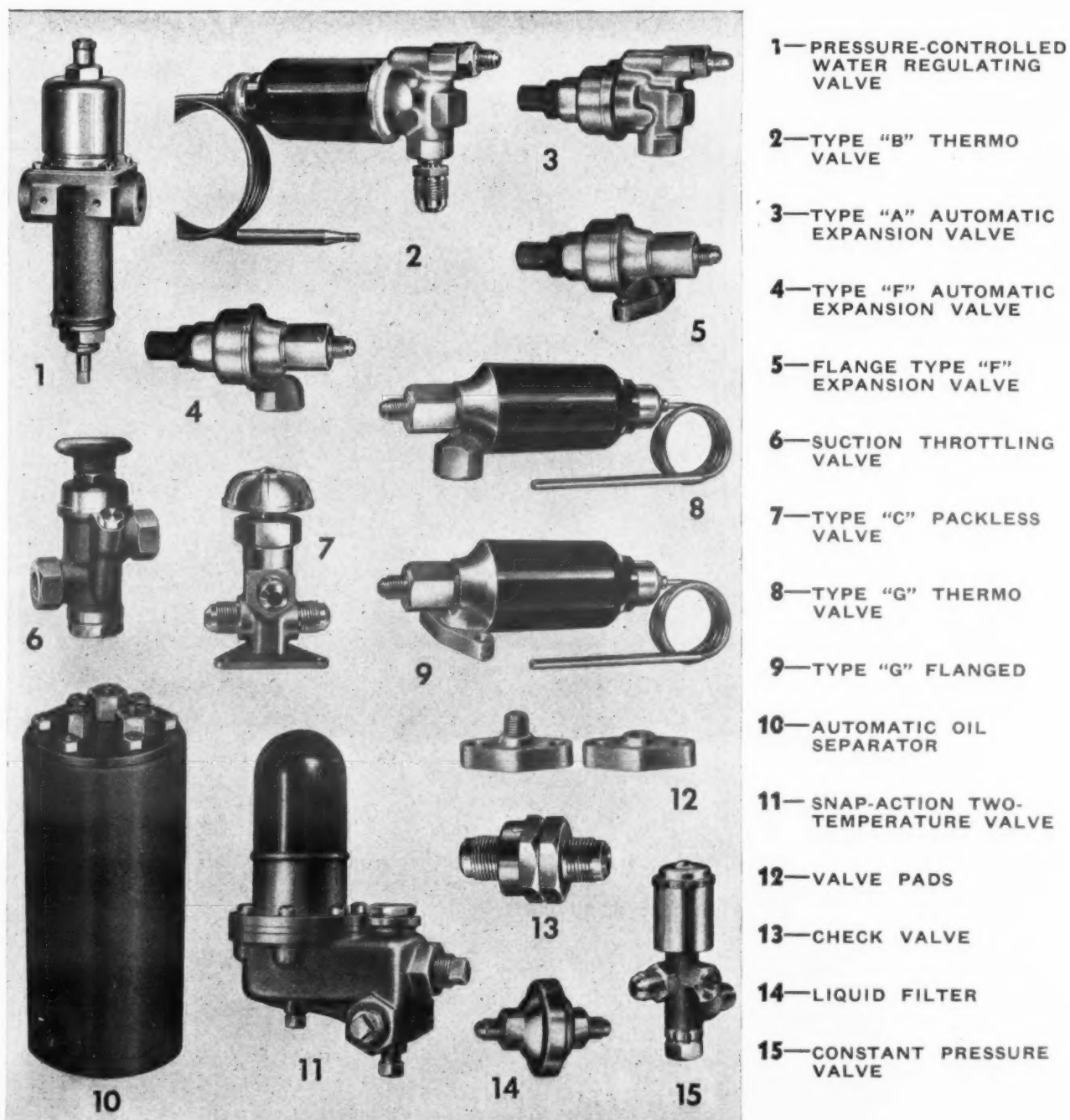
If yours is a small town community—don't go high hat. Show the ladies your best equipment but put it against an inexpensive background of smart washable wall paper and even inexpensive open shelf cabinets. The kitchen will look more attainable.

I want to see more "budget" kitchens. I think they might appeal to a wider audience than some of the diamond-hung Arabian Nights kitchens I've seen recently. As a matter of fact, here's a quotation one of our interviewers picked up in a recent home call:

"I love to look at the new model kitchens, but please tell me what to do with my kitchen to make it more attractive. It must be possible for even us ordinary folks to do something."

## A Partial Showing of the . . . FAMOUS BLUE RIBBON LINE

Here are illustrated a few of the outstanding refrigeration devices made by the American Injector Company. Complete bulletins on the full line of Blue Ribbon products furnished on request. Have these bulletins in your files for purposes of reference. Write today.



- 1—PRESSURE-CONTROLLED WATER REGULATING VALVE
- 2—TYPE "B" THERMO VALVE
- 3—TYPE "A" AUTOMATIC EXPANSION VALVE
- 4—TYPE "F" AUTOMATIC EXPANSION VALVE
- 5—FLANGE TYPE "F" EXPANSION VALVE
- 6—SUCTION THROTTLING VALVE
- 7—TYPE "C" PACKLESS VALVE
- 8—TYPE "G" THERMO VALVE
- 9—TYPE "G" FLANGED
- 10—AUTOMATIC OIL SEPARATOR
- 11—SNAP-ACTION TWO-TEMPERATURE VALVE
- 12—VALVE PADS
- 13—CHECK VALVE
- 14—LIQUID FILTER
- 15—CONSTANT PRESSURE VALVE

**AMERICAN INJECTOR COMPANY**  
RILEY ENGINEERING CORP. Associate  
1481-14TH ST. PHONES LAFAYETTE 0350-0552 • DETROIT, MICH.



## AIR CONDITIONING AND REFRIGERATION NEWS

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## Industry Statistics

TEN YEARS AGO there were numerous optimistic individuals who were enthusiastically promoting new companies, or expanding old ones, for the manufacture of electric refrigerators. Later developments indicated that many of them were long on vision of the future possibilities of the business, but somewhat short on practical plans for handling the preliminary stages of the industry's development.

Possibly some of the dreamers of the day may have predicted that within a decade more than two million refrigerators would be sold in a single year and that the annual sales during the 10-year period would average in excess of one million. We can be pretty sure, however, that if anyone did foresee this accomplishment he did not anticipate the event of the world's greatest economic depression in that same period.

Unless one has a special gift for grasping the significance of large figures, together with an intimate knowledge of the great American home market, it is difficult to comprehend the enormous job which has been done in producing and selling such a quantity of a relatively high-priced item of household equipment. It is even more difficult to visualize what that activity has meant to the American people in terms of convenience, health, and personal satisfaction.

The columns of figures on the front page of this issue, showing how the totals have been accumulated during the past three years, will be of special interest to readers with a statistical turn of mind. No doubt those who have made a careful study of previous tabulations, and those who have had occasion to make estimates of their own, will be curious to know just how we have arrived at some of the totals.

### World Sales

Anticipating such questions we will explain that the "World Sales" are based upon figures which are collected monthly from the leading companies by the National Electrical Manufacturers Association (Nema). Only the totals for all companies are released by this organization. Definite information is given as to just which manufacturers have contributed data

but the records for individual makes is not divulged. Therefore, we start our calculations with the assumption that the Nema tabulations are correct since we have no reason to doubt the authenticity of the data. The next step in the problem, that of determining the sales of other companies not included in the Nema totals, is strictly up to the editors of the NEWS. We have estimated that the Nema sales represent about 93% of the total of all United States manufacturers.

It should be noted, however, that the term "household electric refrigerators" is not limited to complete self-contained systems, since it is necessary to take into consideration multiple systems and other installations where the unit is separated from the cabinet in order to arrive at an estimate of the number of "homes" in which electric refrigeration is used. To meet this situation the cooling unit, or evaporator, is taken as the numerical unit.

Next we deduct "Exports" using data furnished by the Bureau of Foreign and Domestic Commerce of the U. S. Department of Commerce, in order to get the number sold in the U. S. only.

### Retirements

Now we come to "Retirements," which is being substituted for "Obsolescence and Replacement," the term formerly used to cover equipment included in previous years' totals but which is no longer in use. It should be understood that this figure does not refer to "trade-ins." It represents an estimate (and only an estimate) of the number which have been permanently taken out of service.

Readers are cautioned not to place undue confidence in the "retirement" figures because no reliable records are available as a basis for this classification. In making a guess that the number of "retirements" is approximately 10% of the total number which have been sold since the beginning of the industry some 20 years ago, we have taken numerous factors into consideration.

Included in this total are practically all units more than 10 years old (although we know that some homes are still using machines of greater age). Also included is the entire production of numerous early companies whose designs proved to be faulty. The period during which thousands of multiple systems were replaced by individual units accounts for a large quantity of "retirements."

Another considerable portion of this total includes the very cheap models of several makes which were put on the market a few years ago when quality was sacrificed in an effort to satisfy the craze for low price. Other additions were made in recognition of the destruction which accompanied vacancies in rented homes and apartments and the wholesale replacements when such properties were being modernized after receivership sales.

The relatively low estimate of "retirements" during the past year is based upon a consideration of the present widespread practice of overhauling and reselling units which have been traded in for new models. The growth of independent service companies, second-hand dealers, and others specializing in the reconditioning of used equipment has now become an important factor affecting this figure.

### Stocks on Hand

Since the sales figures reported to Nema represent sales to distributors and dealers, we must deduct their unsold stocks before arriving at an estimate of the number of units in actual use. For a while the Nema headquarters released inventory figures, but

lately this data has not been made public. Even the former Nema inventory figures were none too plain because of complicated corporate relationships between factories, branch offices, and some distributorships.

For example, factory sales may show a transfer of merchandise to a branch office warehouse or to a manufacturer-owned distributor. From a statistical standpoint such a transfer may represent a sale, but this type of transaction is of little value in analyzing market development.

It might also be pointed out that a large number of sales by a dealer to the ultimate user are really not completed at the time of delivery, since most of the electric refrigerator business involves time payments. In some cases the time payment paper is purchased by a financing company which is in turn owned by the manufacturer. Thus the manufacturer sells the refrigerator to a distributor, who sells it to a dealer, who sells it to a user, who signs a paper which conveys title to a financing company which is owned by the manufacturer who made the refrigerator.

In actual practice it finally works out that the customer completes payment and the refrigerator becomes the real property of the user. Two or three years may elapse before the transaction is completed, but we have not attempted to delve into these complications in our investigations.

The figure on "Wired Homes," furnished by McGraw-Hill Co., is used as the basis for estimating the present saturation of the potential market. Perhaps this figure should also be investigated to determine just what is meant by a wired home. No doubt there are a great many homes of a sort which now have electric lights, but which are very poor prospects for an electric refrigerator.

### Better Records Needed

We have often wished that some way could have been found, when the industry was young, to keep a life history of each individual refrigerator. Such a record would be extremely valuable and would be well worth its cost.

Right now, when the air-conditioning industry is just getting under way, seems to be an opportune time to suggest that the industry adopt some method of securing accurate statistics on all air-conditioning installations.

In this issue will be found some very interesting data collected by the Public Utilities in the principal cities. While the power companies should have no difficulty in learning about large installations, it is doubtful whether they can keep track of all the room coolers and unit air conditioners which may be hooked on to their lines, unless some comprehensive plan is devised for that purpose.

The data compiled by the Department of Commerce is, we have been told, hopelessly inadequate as a measure of the true progress of the air-conditioning industry. Manufacturers of condensing units inform us that they have no way of knowing the ultimate application of such equipment. There is nothing inherent in the design of a compressor which determines whether it will be used to cool a butcher box or to air condition a residence.

Since the surface of the air-conditioning market has, so far, only been scratched, it is hardly worthwhile to bother about an estimate of the saturation of the potential market. Of real interest right now, however, are the estimates which manufacturing executives are making regarding the business which they expect to obtain during 1937. This subject will be discussed, and some definite figures will be given, in next week's issue.

## - LETTERS -

### First Agent for the News in Spain

Suministros Frigoríficos, Ltda.  
Accessories of All Kinds for the Refrigeration Industry  
48-50 Maria Diaz de Haro, Bilbao  
Dear Sirs:

We have the pleasure to acknowledge receipt of your favor of Oct. 28, contents of which has received our best attention.

In answer to your suggestion we beg to inform you that we gladly accept to represent the News as an agent for your publications in Spain, and we wish to suggest you to add our name to your agent's list as your first agent in our country.

We are in the best position to get for you as many subscriptions as possible from any part of Spain, due to the fact that we have branches of our firm in Madrid, Barcelona and Valencia, and because as we deal absolutely in everything concerning the refrigeration industry (excepting condensing units) we have as our clients everyone of the dealers, jobbers and distributors of our line in Spain.

In spite of the actual abnormal circumstance in our country, we have already started to write to our various customers informing them how we have been named your Agents and at the same time about your publications.

Herewith we send you the form "A" stating the publications we wish to receive from you. For the payment of them we are ordering Messrs. F. Marti & Co., 115 Broad St., New York, to send you a remittance for our account.

At the same time we wish to inform you that actually we are receiving your review in due course, but undoubtedly due to the circumstances in Spain we have not received your numbers of July 29 and Sept. 30, and as we have got your publications of a later date, we believe the mentioned ones have got lost, and for this reason and as we do not wish to miss any of the News, we beg you to send us the issues in question.

Also, please place our name on your mailing list, in order to receive all trade literature and catalogues.

Assuring you of the great interest we have in all your publications.

JEFE DE VANTAS

### Is There a 'News' Fever?

The Bush Mfg. Co.  
Hartford, Conn., U. S. A.  
Philadelphia, Pa., Office  
2204 Market St.

Dec. 28, 1936.

Editor:

I am in receipt weekly of your valued publication and have noted upon each opening of the paper that my sensitive nasal passages start their usual protest against some substance that is brought in thereon.

I also note upon feeling of the paper surfaces that there is a surface dusting of some type. Please advise me what this substance is in order that I may add it to my own personal taboo list.

You have guessed it—I suffer from Hay Fever, or rose fever, or flowers generally and many other substances, and hope if I live long enough, to identify these for the most part and avoid contact with them.

Air conditioning is the main hope of folks like the writer who react to many air-carried irritants, but alas, when the main advocate of air conditioning is itself covered with a similarly allergic substance, then there is but the gas mask for final refuge.

I am in sorrow at this parting, but await your advice as to the nature of this new menace.

A. H. KEELER.

Answer: In order to avoid "smearing" the ink on the pages of the paper while folding them, the printer uses a powder known as French chalk to dry the ink. The printer has been warned about using too much of the powder.

### A Request for Air-Conditioning Data

The State Young Men's Christian Association of Maine  
Savings Bank Building  
Waterville, Me.

Editor:

We are trying to build up a reference library to use in connection with our various conferences and especially our Industrial Conference which has in its membership, many foremen and executives.

We also wish to have material available so we can answer questions from inquirers or loan out the books secured, to those who are active in studying the new aspects of many of our industrial problems.

I am especially anxious to get a good group of books, reports, and pamphlets dealing with the problems of air conditioning and I understand that your office is one of the best sources of information for detailed literature on air conditioning. I am therefore writing to see if you will send me a list of the material you

have that is available for public distribution and for sale.

Will you also give me a list of the best literature that has been issued recently, either by utility companies or groups of engineers or by manufacturers of air-conditioning apparatus. I would want material that pertains to the best method of computing the various air-conditioning problems salesmen would meet. Also the reports on campaigns conducted by utility companies and manufacturers for the increased use of air-conditioning apparatus, especially in the southern states or the tropics, also any literature that deals with experiments in finding any simple and inexpensive air-conditioning apparatus for the lower-priced markets.

I have available the Annual Guide and several correspondence courses and one or two reference books on air conditioning, but I am very anxious to get something definite from the field.

Thanking you in advance for whatever cooperation you are able to give me.

A. A. HEALD,

Associate State Secretary.

### Hansen Foresees Good Season in Australia

F. C. Lovelock Ltd.  
"Everything for Refrigeration"  
235-239 Clarence St., Sydney  
Australia

Dec. 2, 1936

Mr. Taubeneck:

Greetings from Australia! It was good to get your letter, as I was beginning to think that since your return to the U.S.A., you were so "snowed under" with work that possibly you were never going to find time to drop us a line.

Speaking generally, I am able to tell you that this season is going along exceedingly well, and even now we are in the position to form the opinion that the 1937-38 refrigeration season in Australia will break further records.

Regarding the Governmental restrictions, these still stand, and it is impossible to import from the U.S.A. electric refrigerators or electric refrigeration parts.

This legislation has given a tremendous fillip to local production, and although products manufactured in the U.S.A. are still selling here, it would seem that as soon as present stocks have been disposed of, the people handling these lines will be obliged to have their requirements made in the Commonwealth.

In your letter you have asked "What service troubles have been especially bothersome in recent months?" On handing this query over to our technical department, I received the information that generally speaking there has been nothing outstanding in the way of troubles, but our department feels that something might be done in the direction of a campaign for more care and cleanliness on the part of service and installation men.

It has been experienced in Australia, and no doubt all over the world, that moisture and dirt in refrigeration systems cause far too much trouble with solenoid valves and other gear.

No doubt a check-up could be made with the manufacturers of valves and general gear, to find out if on investigation of complaints, that in lots of cases it is not the equipment that is at fault, but the human element.

It was good to see your signature again and to know that you are still "on deck." I would personally appreciate hearing from you more often further news of your well-being and good health—so do not forget to drop a line as often as you can.

F. HANSEN,  
General Manager

### He Wants All of 'Air Conditioning Made Easy,

Gentlemen:

Enclosed please find check for \$6.50. Please be good enough to send me the REFRIGERATION AND AIR CONDITIONING SPECIFICATIONS BOOK, the REFRIGERATION ENGINEER'S MANUAL, and one year's subscription to AIR CONDITIONING AND REFRIGERATION NEWS. I would appreciate if you would date the subscription to the News back so that I could get the issues containing the articles on "Air Conditioning Made Easy" by Mr. F. O. Jordan.

Also, please put my name on your mailing list to receive service data, trade literature, catalogs and bulletins on air conditioning and automatic heating. Thank you.—John R. Ray, 514 Walnut St., Pine Bluff, Ark.

### Duprene Seals

H. R. Van Deventer  
Patent Attorney  
342 Madison Ave.  
New York City

Editor:

Referring to your question No. 2990, "Source of Duprene Seals," (Your Dec. 16 issue), if you will tell your correspondent, he may be able to get the Duprene seals he wants from M. R. Buffington, c/o Lea Fabrics, Inc., 768 Frelinghuysen Ave., Newark, N. J. Mr. Buffington specializes in Duprene specialties.

H. R. VAN DEVENTER



### Motor Equipment Co. Licensed Under Strang & Brus Patents

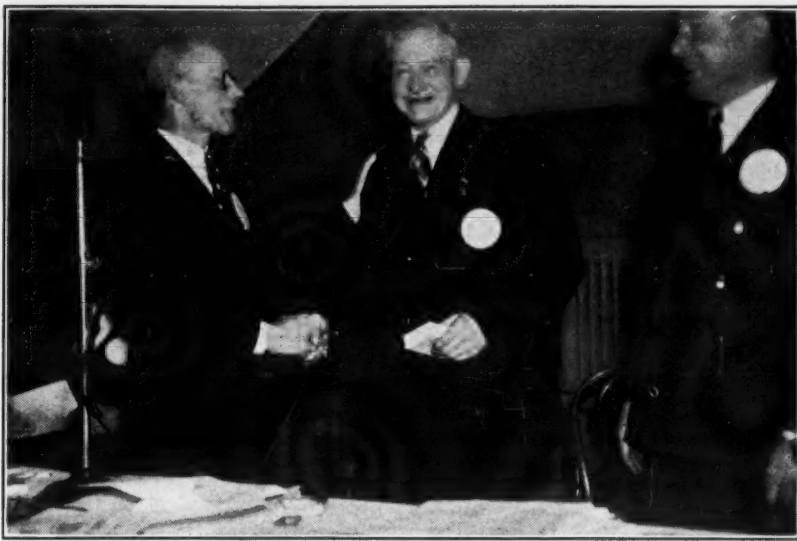
WICHITA, Kan. — The Motor Equipment Co., automotive accessories manufacturer and jobber, has acquired the exclusive license to manufacture all types of evaporative condensers under the Strang and Brus patents, according to Fred Man-koff, president of the company.

Under the new arrangement, Motor Equipment Co. will handle distribution of the Strang evaporative condenser, while the units will be manufactured by its subsidiary, Harrison Iron Works Co., of Wichita. All types and sizes of evaporative condensers will be manufactured and distributed.

John J. Strang becomes associated with Motor Equipment Co., heading the organization's sales and distribution activities.

The Strang evaporative condenser combines a pre-cooler in connection with the recirculated and sprayed water and counter-flow air stream, and is said to be adaptable to either old or new systems. A saving of 90% on water costs is claimed.

### Fedders' Oldest 'Old Timer'



L. F. Fedders (left) and T. C. Fedders (right) congratulate Christ Pocking on his 24 years and seven months association with Fedders Mfg. Co. at the recent "Old Timers" banquet held by the company.

the electric utilities can be adopted for the added load when air conditioning and refrigeration are to be included.

"(F) All of the above major items have to be given careful thought by both buyer and collaborator, to be welded into a coordinated design suitable for the buyer's use. Then, an automatic control suitable to the apparatus, and also to the operating personnel to be anticipated, has to be designed and the type of control carefully selected.

#### CONTROL FULLY AUTOMATIC

"The majority of retail establishments have from past experience indicated that a fully automatic control system covering all of the variations encountered during the different seasons of the year is indicated and desirable. This, of course, means a greater first investment in a small measure, but the buyer does not want to be troubled and wants the system to function as nearly fool-proof as possible.

"The tendency is not to hire several experienced high-priced men, especially for the small systems and, therefore, the manager of the establishment must be relieved of as much attention as possible; and his home office wants to be assured that effective operation of the air-conditioning and refrigerating machine will continue as planned.

"The majority of installations made, especially the small ones, would indicate that a systematic inspection service to be paid for by the buyer, such service to be rendered by competent men of local origin, is the best solution; and minor adjustments and complaints that always arise can be

taken care of quickly and efficiently.

"The large buyer in almost every case will have a highly developed staff of architects and engineers and also construction men who design new projects, supervise and maintain their present properties. It is with such a staff of men doing the work all the time for the particular chain that the air-conditioning organization they select will have to collaborate.

"The large buyer is accustomed to systematic control and the addition of units to his chain or the remodeling of his present units is all done practically at one focal point. In charge of them you have this staff of men accustomed to the particular technique that they desire.

"It is only natural that the buyer's organization will always be seeking assistance in the various technical details that enter into their particular project, and in incorporating air conditioning, it is only natural that they welcome those specialists in the air-conditioning field who have had the largest and widest experience.

#### COLLABORATION NEEDED

"They all have to work under high pressure, and projects have to go out on schedule. Therefore, they look to people who will collaborate with them, who have the engineering ability, experience and the personal knowledge of their own business so that air conditioning can be incorporated surely, efficiently and with a confidence that after the installation is made, it will give the result the buyer must have.

"In collaborating with a staff of this kind, it is only by experience with their particular projects and with what want that they can effectively

(Concluded on Page 23, Column 1)

## - SELLING AIR CONDITIONING -

### Dealer's Best Service to Large Purchaser Is Corps of Air-Conditioning Specialists, Buensod Tells Westinghouse Group

MANSFIELD—The most important service an air-conditioning distributor can offer the large buyer is a well-rounded group of specialists trained in the art of air conditioning, refrigeration, and automatic control, who know how to balance first cost and operating costs so that the best possible results are obtained from any type of installation. A. C. Buensod, president of Buensod-Stacy Air Conditioning, Inc., told Westinghouse air-conditioning distributors at their recent meeting.

"It has often been said that the fundamental success of the large buyer depends on his manufacturing or offering a product or service that people will need; producing and distributing such a product or service efficiently, so that more people will buy.

"Our task in the air-conditioning industry is somewhat similar in that we must have a product and a service that is in demand, and if we are efficient in our use of the equipment and the technique, which is so necessary for the air-conditioning art, the large buyer will buy.

"I have found that the buyer will quickly appraise the highly technical coordination of air-conditioning equipment and the attendant service that is required for any ordinarily successful results to the user. It is up to us then to simply prove to the buyer our product and services, which he will evaluate in the practical common sense way of the return on his dollar investment and time.

#### INSTALLING THE SYSTEM

"Let us review the processes involved concerning the installation of any air-conditioning system by the large buyer, particularly from his viewpoint.

"First, the buyer has a particular kind of business with certain definite requirements incidental to his business, and may have certain practices that have been formulated by long custom. He has many units in his charge, all such units being designed for service to the public and profit to the buyer. All of the units have certain similarities of design and their own technique must conform to some systematic control. This will definitely require incorporation of an air-conditioning system in their manner, designed to fit their particular kind of layout.

"Second, the buyer has to decide which of his units will have air conditioning, and if he is not versed in the amount of the investment, preliminary surveys and budgets will have to be undertaken. The inclusion of air conditioning is sometimes dictated by his own competition, but I find that the most progressive buyer selects those sites only that are now profitable without air conditioning and the inclusion of air conditioning in such a store is a service to the public that buy, and is in effect an investment in good will.

"Third, before preliminary budgets covering the first cost of conditioning any of the sites are made up, the buyer has to determine the capacity needed in any particular project. Most

difficult of the buyer's problems is one of determining the number of people, the light load and incidental heat load that occur on the premises which he wants conditioned, as the combined load from these sources usually determines the actual capacity requirements of the air-conditioning apparatus.

"It is true the physical building itself at times needs quite some attention, as for instance, if a store or premises to be conditioned is a one story building with a terrific sun load on the roof, it is easy to pick out and figure what insulation might be used to cut down the heat gain.

"However, determining the number of people that a system should be allowed is quite a disputed point at the present time, as it is most difficult to predict the people load to be expected when you install air conditioning. I find, however, a certain individual knowledge of the particular premises or types of business is desirable, because in general, all retail establishments are somewhat seasonal, and the expectancy of people load is quite different in summer than it would in the spring or fall, when a much higher loading in people is always encountered.

"In general, it would seem logical that an average number of people, as the summer load would fix the refrigeration capacity, but the higher loading in people, which you might expect at other times of the year, should determine the actual capacity in air being distributed. The reason for this is quite obvious in that ventilation and air handling are used throughout the year and the system should, in effect, be able to take care of all the seasons of the year, but in the summer time, to lower the cost of your investment, refrigeration should be figured at a somewhat lower capacity than for any possible peak that the store might have outside of the summer months.

#### ITEMS IN SCHEME

"Fourth, the buyer having indicated the capacity requirements that he wishes to take care of, the next step in the process is to make a coordinated scheme, which must include the following items:

"(A) The air distributing duct system, both supply air, return air and possibly exhaust air, has to be carefully worked out with the physical limitations as imposed by the buyer.

"(B) Suitable space on the premises has to be picked out to house the air-conditioning and refrigerating apparatus.

"(C) The source of heat for winter use and also for use in the intermediate seasons for ventilation has to be determined. This may mean a revamping of the present heating methods, if the premises to be conditioned are now existing. Experience teaches us that this is one of the most important things to do because you cannot use an air-conditioning system except for cooling, unless you have available at all times, a source of heat suitable to keep the place comfortable, during other seasons when cooling is not required.

"(D) The source and cost of city water for condenser use has to be determined as against the cost and investment required if water conservation equipment is to be considered, or if well water is procurable.

"(E) The characteristics of the power available and the rates prevailing for both power and light must be carefully gone into so that suitable schedules that may be available from

# Automatic Air Conditioning Controls

## for EVERY PURPOSE



WHATEVER your control problems may be with an air conditioning or cooling system installation, Minneapolis-Honeywell automatic controls are the answer to them. Behind Minneapolis-Honeywell controls stand 52 years experience as the oldest and largest manufacturer of control equipment and unlimited laboratory and field research. Each control system is tailor made to meet the individual requirements of your particular installation. The Minneapolis-Honeywell Engineer in or near your city is available for consultation with you on any problem pertaining to air conditioning or cooling control. Call him in. There is no cost or obligation. Keep in mind always that complete automatic control is your assurance of perfect satisfaction and economical operation. Minneapolis-Honeywell Regulator Company, 2807 Fourth Avenue So., Minneapolis, Minn.

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## MINNEAPOLIS-HONEYWELL

Control Systems

BROWN INDUSTRIAL INSTRUMENTS FOR INDICATING, RECORDING AND CONTROLLING



## - AIR CONDITIONING NEWS -

### 250 Conditioners Installed In San Francisco in 10 Mos.

SAN FRANCISCO—Two hundred and fifty installations of air-conditioning equipment were made in the territory of Pacific Gas and Electric Co., San Francisco, during the first 10 months of 1936, according to R. E. Fisher, vice president in charge of public relations and sales for the coast utility.

The total horsepower of the installations was 1,893. The 1936 figures denote a marked increase over installations made in 1935 when 201 installations aggregating 872 hp. were made.

Previous to 1935 there were reported 462 installations having a total of 3,925 hp.

Of the major installations made during 1936 in the company's territory, two were for theaters, two for department stores, one for a hotel, and one for a court house. The theater equipment had 55 hp., the department store equipment had 260 hp., that of the hotel had 42 hp., and that of the court house had 197 hp.

### Savannah Installations Total 15 for Year

SAVANNAH, Ga.—Fifteen air-conditioning installations aggregating 211.75 hp. were made during the past year in the territory served by the Savannah Electric & Power Co., according to J. E. Averett, sales manager.

Prior to 1936, the company kept no record of installations; hence complete records are not available for tabulation.

Installations made during the past year were classified as follows: stores, 3, 22.5 hp.; hotel restaurants, 3, 55 hp.; office buildings, 2, 45 hp.; residences, 2, 5.75 hp.; bank, 50 hp.; barber shop, 3 hp.; private office, 1/2 hp.; tap room, 10 hp., and night club, 20 hp.

### First Year's Conditioning Sales in Seattle Total 12

SEATTLE—Twelve installations of air-conditioning equipment having a total of 23 hp. were made in the Seattle territory during the first 11 months of 1936, according to Tom D. Fulford, General Sales Manager of the Puget Sound Power & Light Co.

Eleven of the installations were for offices, the other being for a hospital. The office equipment had an aggregate of 17 hp.; that of the hospital had 6 hp.

Mr. Fulford states that prior to 1936 no air-conditioning equipment had been sold in the Seattle territory.

During the year just past, both the General Electric Co. and The Carrier Co. set up sales organizations in Seattle.

### Unit Coolers Plus Central Station to Cool Office Bldg.

HUTCHINSON, Kan.—The stores and offices in the new Wolcott building here, scheduled to be completed about April 15, will be equipped with Carrier air conditioning of both central station and unit types.

Individual office control will be furnished by 138 Carrier Weather-master unit coolers, while first floor stores will be conditioned from a central plant system.

Filtered air will be drawn from the top of the building, and water for pre-cooling will be taken from a shallow well beneath the structure at a temperature of 63° F.

This new building is constructed of verde antique marble, Indiana limestone, and brick. Concealed wiring will lead to 12 electric outlets in each suite; high speed elevators will give 24-hour service; automatically cooled drinking fountains will be installed; and a modern radio aerial system will be provided for each office.

## Extended Use of Air Conditioning Is Seen In Disease Treatment

NEW YORK CITY—Great strides in air conditioning as related to the treatment of diseases are forecast for 1937 by W. A. Danielson, chairman of the committee on research of the American Society of Heating and Ventilating Engineers, in his annual report to society members.

The success which has attended experiments in fever therapy, using a specially constructed air-conditioned fever cabinet, by members of the medical staff of St. Francis Hospital, Pittsburgh, cooperating with the society's research laboratory, has resulted in the inauguration of research to determine of how much use air conditioning can be to the physician and surgeon in controlling the atmospheric environment in sick rooms, receiving wards, operating rooms, and clinics, Mr. Danielson announced.

### SOCIAL DISEASES TREATED

Research at St. Francis was concentrated on alleviating social diseases. Forty-two cases were treated and the results, according to F. C. Houghton, director of society research, and Dr. M. B. Ferderber, of the hospital staff, "were satisfactory in most cases."

Further work at the medical schools of the Universities of Pittsburgh and Illinois will determine whether scientific methods of air conditioning can be successfully applied to other ailments, including hay fever, asthma, rheumatism, and several kinds of heart disease, Mr. Danielson stated.

### MORTALITY RATES CUT

Installation of air conditioning in the operating rooms of several hospitals, he said, has cut mortality rates as much as 10%, and pointed to investigation now being conducted by medical authorities in cooperation with the society on the effect of conditioning in aiding convalescence in medical wards.

Of this section of the society's research, Walter L. Fleisher, consulting engineer and technical advisory committee chairman, said: "The study of the abnormal often brings about an investigation of the normal, and one interest today in the cooperative movement with the medical profession as to the effects of air conditioning in pathological cases holds promise of knowledge that will instruct us in the approach to general 'comfort' conditioning."

This cooperative research with medical and health authorities is one of 30 problems of the enlarged program for 1937 in which more than 200 engineers, scientists, and industrial leaders will participate, it was announced.

### OPTIMUM VARIES

Tests of a large number of people in all stages of dress, age, and physical condition, which the society conducted last summer, show that a summer cooled building in Toronto must be at a lower temperature than one in Pittsburgh or Texas in order to provide maximum comfort and minimize the "shock." Draftless ventilation and reduction of the possibility of contagion in public buildings are other additions to comfort and health which society research will attempt to make in 1937.

The society expects to spend \$100,000 on air-conditioning research over the next two years, financed by subscription from its members and the industries which draw upon the knowledge which it gathers.

### WORK ON INSULATION

The program for 1937 will include intensive work on insulation and heating systems. One phase of this will be development of better and lower cost heating for small homes. Prevention of the impairment of insulation by moisture in winter conditioned air, now causing great annoyance to builders, through standardization of insulation practice and determination of the best ways of installing glass and the new glass brick, are included in this program.

Heat transfer of the new finned tube radiators and coolers, decrease of the noise produced by conditioning equipment, investigation of cooling methods in relation to air treatment, and studies of the performance of radiators directed toward improvement of their design will be other features of the year's research.

## Types of Businesses Installing Air Conditioning Listed in Survey of Large Cities

On this and the 4 pages following is presented Part 1 of what AIR CONDITIONING AND REFRIGERATION NEWS believes to be the most comprehensive survey of air-conditioning installations by classifications of the market, ever to be published.

Part 1 is comprised of data for most of the cities in the "first 30" of population rank in this country. Part 2, which is scheduled for publication in next week's issue, will present information on other large cities, and also on widespread areas in a number of states.

The figures obtained in this survey were obtained through the cooperation of the power companies who have done a commendable job in collecting and bringing up to date the data for the various areas.

Installations are classified by type, and their number and refrigeration tonnage, or connected horsepower, are shown.

In most cases the information is divided into four tabulations: (1) all installations made prior to 1935; (2) installations made during 1935; (3) installations made in 1936, or for that part of 1936 on which figures have been obtained; and (4) total installations reported to date.

In later issues will be published even more complete market data information on air-conditioning installations in the form of those complete reports issued by some utilities which give the name and address of the establishment where the installation has been made, the make of equipment installed, and the size.

## - AIR CONDITIONING SURVEYS -

### New York Edison Co. (Manhattan & Bronx)

Classification	Prior to 1935		During 1935		11 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Banks	14	2,148	7	809	4	341.33	25	3,298.33
Barber Shops	0	0	2	125.3	0	0	2	125.3
Beauty Parlors	1	9	1	3.2	2	37.75	4	49.95
Offices	143	8,895	31	285.4	26	876.45	200	10,056.85
Stores	44	3,608	60	2,117.31	59	1,694.4	163	7,419.71
Clubs	3	74	3	13.25	2	50.25	8	137.5
Industrial	12	434	6	53.75	20	557.03	38	1,044.78
Office Buildings	0	0	2	370	1	67	3	437
Miscellaneous	25	1,977	9	100.7	0	0	34	2,077.7
Residences	29	93	4	10.3	5	20.33	38	123.63
Restaurants	102	4,455	65	2,302.63	89	2,526.09	256	9,283.72
Showrooms	11	78	1	12.5	26	981.76	38	1,072.26
Theaters	52	12,415	19	2,160	8	344.9	79	14,919.9
Hospitals	0	0	0	0	1	50	1	50
Dance Studios	0	0	0	0	2	148.4	2	148.4
Hotels	18	2,277	0	0	2	170.33	20	2,447.33
Radio Studios	5	2,086	0	0	1	10	6	2,096
Pullman Terminals	0	0	0	0	1	240	1	240
Auditoria	0	0	0	0	1	136	1	136
<b>Total</b>	<b>459</b>	<b>38,549</b>	<b>210</b>	<b>8,363.34</b>	<b>250</b>	<b>8,252.02</b>	<b>919</b>	<b>55,164.36</b>

### Chicago, Ill.

Classification	Prior to 1935		During 1935		11 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Banks	8	1,252.5	0	0	2	428.5	10	1,681
Brokers & Exchanges	9	773	0	0	6	110	15	883
Beauty Shops	5	67.75	7	45.25	3	47.5	15	150.5
Churches	3	160	1	7	0	0	4	167
Civic Buildings	1	116.5	0	0	0	0	1	116.5
Clubs	4	359	0	0	2	22.5	6	381.5
Dance Halls	4	465	0	0	0	0	4	465
Physicians and Dentists	4	3.5	11	7.75	9	6	24	17.25
Drug Companies	7	160.25	14	134.25	13	185	34	479.5
Hospitals	7	41.5	7	49.75	3	2.5	17	93.75
Hotels	22	3,406	2	148	4	64.5	28	3,618.5
Barber Shops	0	0	0	0	3	9.75	3	9.75
Industrial	18	303	1	1.5	1	50.5	20	355
Bakery	24	3,500	5	233.25	10	397.75	39	4,131
Candy	19	2,100.5	5	145	3	26.75	27	2,272.25
Printing	19	1,141	9	119.5	9	175.75	37	1,436.25
Miscellaneous	52	6,317	31	698.75	57	1,733.5	140	8,748.25
General Offices & Buildings	110	267	61	76.25	91	115.5	262	458.75
Private Offices	45	99.5	24	26.25	47	39.25	116	165
Residences	92	2,609.5	51	1,098.25	65	1,493	208	5,190.75
Restaurants	8	22.5	8	13.5	15	73.25	31	109.25
Candy	12	1,401	16	449.5	19	1,139	47	2,989.5
Clothing, Department	5	21.5	3	13.5	6	48.75	14	83.75
Fur	7	73.5	8	55.5	8	124.25	23	253.25
Shoes	7	385.75	0	0	4	63.5	11	448.25
Food	7	830	9	312	12	537.75	28	1,679.75
Miscellaneous	3	367	2	52.75	0	0	5	419.75
Studios	10	102.25	11	109	12	131	33	342.25
Undertakers	105	17,134	31	1,665	13	584.5	149	19,284
Theaters	617	43,482	317	5,461	417	7,588	1,351	56,580

### Philadelphia Area

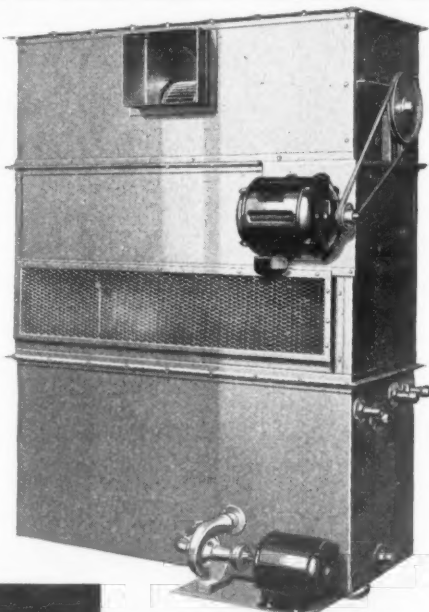
Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Apartment	6	4	1	1	6	8.20	13	13.2
Private Homes	39	65	25	75	27	48.27	91	188.27
Banks	4	435	0	0	1	6.5	5	441.5
Clubs	1	3	0	0	1	24	2	27
Doctors' & Dentists' Offices	6	18	4	6	3	8.3	13	32.3
Funeral Parlors	5	42	2	11	4	58.3	11	111.3
Hospital Operating Rooms	1	95	0	0	0	0	1	95
Hospital Bed Rooms	3	38	0	0	1	.75	4	38.75
Hotel Guest Rooms	0	0	0	0	1	4	1	4
Offices	43	285	13	190	47	554.55	103	1,029.55
Studios, Broadcasting	2	107	0	0	0	0	2	107
Utility Company Offices	3	232	2	29	0	0	5	261
Barber Shops	0	0	2	2	2	2.75	4	4.75
Beauty Shops	0	0	0	0	3	53.75	3	53.75
Hotel Coffee Shops	1	16	5	177	0	0	6	193
Dining Rooms	1	2,275	0	350	0	0	1	2,625
Office Buildings	28	962	13	540	17	601.3	58	2,103.3
Restaurants	2	1,768	0	0	0	0	2	1,768
Stores, Department	22	687	18	701	29	1,014.85	69	2,402.85
Stores, Retail	28	4,554	10	419	19	945.8	57	5,918.8
Theaters	2	563	0	0	0	0	2	563
Auditoriums	1	6	0	0	0	0	1	6
Churches	2	125	0	15	0	0	2	140
Libraries and Museums	26	466	2	32	2	23.3	30	521.3
Schools	3	290	1	1,762	2	3	6	2,055
Miscellaneous Commercial	7	299	1	5	0	65.5	8	369.5
Bakeries	10	1,059	6	179	3	92	19	1,330
Candy Mfg.	5	90	4	15	0	215	9	320
Chemists	2	238	0	0	0	0	2	238
Leather Mfg.	6	87	1	184	0	0	7	271
Printing & Lithographing	14	698	1	170	2	208	17	1,076
Textile Mfg.	8	895	0	107	2	98	10	1,100
Tobacco Factories	0	0	0	0	1	60	1	60
Dairy Products	2	42	0	0	0	0	2	42
Fruit Packing Houses	0	0	2	39	1	5.5	3	44.5
Fur Storage	7	368	7	145	2	97	16	610
Miscellaneous Industrial	290	16,812	120	5,154	176	4,198.62	586	26,164.62

# Save OVER 90% ON CONDENSER WATER COSTS

THE exclusive patented features of the STRANG EVAPORATIVE CONDENSER, including the submerged condenser and the pre-cooler in connection with the re-circulated and sprayed water and counter-flow air stream, afford the highest degree of condensing efficiency, regardless of summer water temperatures. Eliminates the problem of scale insulation on the outside surface of condensers or the inside surface of condenser water lines, and guarantees the distributor against serious competition.

The rapid development of air conditioning and commercial refrigeration equipment has already overtaken the water supply and sewage disposal facilities of many communities. This condition will undoubtedly bring about the prohibition by municipalities and water departments of the use of such facilities entirely for condenser water purposes.

THE STRANG EVAPORATIVE CONDENSER is designed to afford water-cooled condenser efficiency-plus, regardless of water supply and sewage disposal facilities by reducing the amount of water required for condensing purposes over 90 per cent.



# Strang\* EVAPORATIVE CONDENSER

### For All Sizes and Makes of Refrigeration

Compact STRANG units are now available to fit any size or type of installation, eliminating special mains, towers, pumps, and piping. There is a great saving of space with increased efficiency. Installation costs on old or new jobs are greatly reduced. Operating costs are reduced to a minimum with more than 90% of water costs saved. There are additional savings in power costs due to low head pressure. THE STRANG will pay for itself quickly in these condenser water-cost savings.

Write Today! Your inquiry is invited and full details and illustrated folder will be sent upon request. Every air conditioning and commercial refrigeration contractor, dealer or distributor should know about the STRANG EVAPORATIVE CONDENSER and the possibilities offered for increased business and profit.

## Distributors WANTED

Investigation by reliable individuals or sales and distributing organizations, where qualified to handle distributorships, is invited. With "water" becoming an increasing problem, with the rapid growth of air conditioning and refrigeration, this distributorship will prove one of unusual interest and profit.

# The Motor Equipment Co.

216 West Douglas — WICHITA, KANSAS  
Manufacturing Division, The Harrison Iron Works Co.



## Aid of Specialists Is Best Service, Buensod Says

(Concluded from Page 21, Column 5)  
adopt any particular design of air conditioning or refrigeration. After all, they are buying results. It is, of course, quite true that the equipment that is sold is given very close scrutiny by the buyer, and they will select the equipment that fits in best, produces results efficiently, and which promises to continue to function without undue trouble and with a long life.

### SPECIALISTS' AID

"The most important service we can offer is a well-rounded group of specialists trained in the art of air conditioning, refrigeration and automatic control, experienced in the installation and operation of such systems, and who by long experience in usage know how to evaluate the first cost of such equipment and balance such first cost with operating charges so as to select the most suitable arrangement of equipment for any particular project.

"Most of the work has to be done at the buyer's headquarters, as that is the place where the coordinated design suitable for his use is laid down; that is where you find out the particular physical limitations that the buyer imposes for his particular requirements. The buyer is very changeable usually and makes scheme after scheme in order to arrive at something which might be better and more suitable for them.

"As mentioned before, most buyers have trained architects and engineers, and in some cases, especially on big projects, they find it advisable to have outside consulting engineers design and coordinate the entire mechanical equipment, which sometimes runs into a lot of money in some of the buildings. I have found that it's with these men working directly for an organization that our services as specialists fit in very nicely.

### SCATTERED WORK

"Many projects of necessity are located all over the United States and although headquarters may be in one city, the work to be done may be scattered. I find it particularly advantageous to be able to offer a full engineering service and full contracting service for an entire installation and then collaborate with the fellow distributors located in other cities to the end that the same identical service is offered to the large buyer for all of his projects.

"Installation by local people is a decided advantage to the large buyer, because they are going to do business in that particular city and where such local labor is available, it is naturally to the advantage of all concerned that same is used. In having local collaborators supervise and service the equipment after the installation is in operation, is also very much welcomed by the most progressive users.

### USE BUYER'S STAFF

"I find that the closest cooperation with the buyer's own staff of architects and engineers usually means that he can buy an air conditioning system complete at less first cost than taking competitive figures on various kinds of equipment. It also gives the buyer another very decided advantage in that he has complete control over the installation, and obtains exactly what he wants for his particular business. After all, the large buyer will have determined by actual usage that there are certain requirements he may state which must be adhered to in order to get the results he wants.

"The buyer is looking to us, air-conditioning specialists, to guide him in those things which he cannot know and which are the particular technique of our business. Furthermore, we all must be on our toes to keep on developing more suitable equipment for the various kinds of projects.

"We must indicate and inform the large buyer at all times as to the particular equipment that we have to offer and which is suitable for his projects. Frankly and without any evasion, success can be had only by using the right kind of equipment for any particular job.

"Confidence in the equipment and in the combined engineering and installation ability of all of us must be instilled, and the projects carried out in the speed that is usual with large buyers."

## At Airtemp Distributor Banquet



Officials of Airtemp, Inc., subsidiary of Chrysler Corp., were hosts to more than 200 dealers and distributors at a banquet following a two-day convention in Dayton recently. Among those who participated in the meeting were, left to right, Colonel A. C. Downey, president of Airtemp; A. R. Fors, works manager; H. C. Jamerson, assistant to the vice president; E. W. Garbisch, vice president of J. Stirling Getchell, Inc., New York advertising representatives; A. C. Staley, vice president in charge of engineering; and F. R. Wolfe, secretary-treasurer.

## Profit-or-Loss Factors in Distribution Of Air Conditioning Listed and Analyzed by A. H. Goelz

MANSFIELD—Trained personnel, careful engineering, economical installation, and a knowledge of the cost of doing business spell the difference between profit and loss in the distribution of air-conditioning equipment, Arnold H. Goelz, president of Kroeschell Engineering Co., told Westinghouse air-conditioning distributors at their meeting here recently.

"The distributor for air-conditioning equipment is confronted with problems different from those of distributors of other classes of machinery and equipment, principally because he cannot sell his bare equipment to the user," Mr. Goelz said. "With the exception of self-contained cooling units, air-conditioning equipment as sold by the manufacturer is only part of the complete air-conditioning system.

"It means, therefore, that the distributor's problem is not one of marketing air-conditioning systems. To be correct, it is even more than that—his business is selling results. The air-conditioning distributor must, therefore, be engineer and contractor. His business is the designing, selling and installing of complete air-conditioning systems with results guaranteed.

### DEPARTMENTS NEEDED

"In order to successfully carry on such a business venture, a complete organization is necessary. The following are the important departments required for a proper organization:

"Engineering and sales department; service and construction department; accounting, credit, and collection departments.

"The public is air conditioning conscious and many people are interested in obtaining bids on installations, not knowing whether they are going to buy. Since the prospective buyer can obtain prices without any obligation on his part, he does not hesitate to request bids regardless of whether he is going to purchase. As the cost of making an engineering survey, designing the system, and preparing specifications and estimate is high, every prospect must be carefully analyzed in order to decide if it is worth while going to this expense.

"If it is not definitely known whether the prospect is actually going to install an air-conditioning system, it is, in most cases, advisable to let him know approximately what the cost will be. Approximate estimates can generally be prepared at a small expense, and in many cases this procedure eliminates the waste of making an accurate estimate for a proposition that does not materialize.

### PROFIT FOR BUYER

"Consideration should also be given to the question—How profitable an investment will the air-conditioning system be to the prospective buyer? As a rule, in cases where the investment will be very profitable, there is greater possibility of a sale being made. In connection with all of this, the question of the customer's ability to pay is, of course, of utmost importance and, frequently, is the determining factor.

"When an accurate bid is to be submitted, a careful survey of the premises to be air conditioned must be made and drawings, including layout of the system, and estimate must be prepared in order to submit specifications and proposal. The specifications and proposal should not only describe what the contractor is to furnish, but should also thoroughly specify what the purchaser is to

furnish in order to make a complete installation. The customer is vitally interested in results and the specifications should clearly state and guarantee the results.

"If this is done, the customer knows what additional expense he will have, and what results he has a right to expect. This will avoid any future misunderstandings and the customer will thereby be well satisfied. Although all jobs accurately estimated require the making of drawings, it is only occasionally advisable to submit drawings with the proposal, and in

this case the drawings may be diagrammatic.

"When an order is received, it is necessary to make very complete detailed drawings so that the system may be installed correctly and without unnecessary loss of time. Complete and detailed drawings are the most effective means of keeping down the cost of installation and insuring proper results.

"Regardless of how well and air-conditioning system may be designed, it will not be satisfactory unless properly installed and the contractor must, therefore, have a good construction department. This department must include competent superintendents as well as skillful mechanics.

### SHEET METAL WORK

"Few air-conditioning contractors have their own sheet metal department, but in order to be successful, the contractor should have his own crew of steamfitters and machinists, all thoroughly trained in air-conditioning work. Regardless of whether the contractor does his own sheet metal work he should carefully detail all sheet metal work on his drawings. The responsibility for design and operation should rest with the air-conditioning contractor and not with his sub-contractor.

"Orders for such items as insulation, electrical connections and temperature control equipment should be placed with competent contractors in these particular lines. These sub-contractors are responsible only for their part of the work, and it is therefore necessary for the air conditioning contractor to see that all of this work is properly installed and correctly coordinated with the rest of

the system. When the installation is completed, the air conditioning contractor should make all adjustments and tests and finally be responsible for the successful operation of the entire system.

"Air-conditioning systems are installed in all types of business, many of which operate not only on Sunday, but during the night, and, as a result, it must be possible for the customer to get in touch with the service department at any time. When a service man is sent out, it is seldom known what trouble he will encounter. It is, therefore, necessary that he be able to take care of almost any difficulty that may arise.

### COMPETENT SERVICEMEN

"Service men must be more than screw driver mechanics. Our company has learned that men who have had years of training as erecting machinists or steamfitters have the correct background. They must be men who have had years of experience in the installation and operation of air-conditioning systems. This means that they are familiar with the refrigerating machinery, heating apparatus, temperature control, electrical equipment and all parts making up a complete air-conditioning system.

"Every business has an accounting department, but for air-conditioning contract work this must be broad in its scope and include cost keeping. The costs must be kept accurately and currently so that the contractor may know the cost of every job as it progresses. These costs should be kept in detail so that the cost of each item in the estimate is known.

"It is the practice of our company to give the cost department a copy (Concluded on Page 25, Column 1)

# ANACONDA COPPER REFRIGERATOR TUBES are Unusually SOFT

## .... Easy to bend and flare

Anaconda Copper Refrigerator Tubes have exactly the qualities you need to give the best value in installation jobs.

These quality tubes are *exceptionally soft*. They lend themselves to easy bending and may be *flared without cracking*. They are thoroughly dehydrated to free them from moisture on the inside and the ends are sealed to keep them dry. And, even though they are made of 99.9% pure copper, they are specially deoxidized to increase their corrosion-resistance.

Anaconda Copper Refrigerator Tubes are manufactured according to A.S.T.M. specification B68-33 by methods which assure *unusually bright, clean inside surfaces*. They come to you absolutely free from chips and dirt.

Anaconda Copper Refrigerator Tubes meet the leading manufacturers' specifications for tubes to be used in installation work. They are carried in stock by leading Refrigerator Parts Distributors.



Anaconda Copper Refrigerator Tubes are wrapped in moisture-resistant paper which protects the finish of the tube.

Cutaway view of inside of tube. The inside surface is bright and clean—no dirt, no chips.



# FRENCH SMALL TUBE Branch

THE AMERICAN BRASS COMPANY • General Offices: WATERBURY, CONNECTICUT



## News' Records Trace Growth of Conditioning Industry in Terms of Men, Products and Methods

TWO significant factors have characterized the progress of air conditioning from an age-old dream of "manufactured weather" to an exact science: (1) its remarkable growth both in public acceptance and extension to manifold applications during the past 10 years, and (2) adherence of its makers to fundamental principles of operation which are clearly established, while design improvements and modifications are continuing.

Manifold applications of the science are being discovered almost daily. Homes, theaters, offices, hotels, restaurants, stores, mills, factories, packing plants, mortuaries, hospitals, gold mines, ships—and now automobiles—are all prospective installation sites.

At first an almost exclusively American product, air conditioning is penetrating the foreign market, and with expansion of export organizations and selling of the idea abroad world-wide vistas are being realized.

In 1902, Willis H. Carrier, the father of air conditioning, began his investigations in the field. A Brooklyn lithographing plant found summer atmospheric conditions injurious to its products, and asked the New York office of the Buffalo Forge Co., a firm with which Mr. Carrier was associated at the time, to devise a system of reducing or at least controlling the moisture in the air.

Assisted by E. T. Murphy and R. W. Pryor, Jr., now both prominent heating and ventilating engineers, Mr. Carrier conducted investigations on the absorption qualities of calcium chloride brine, and discovered, in the course of research, that air circulated over coils containing brine and cool water was dehumidified.

The system was soon completed, and by 1905 the Buffalo Forge Co. was manufacturing air washers for commercial applications. Mr. Carrier invented the spray-type humidifier and dehumidifier in 1902, and a few years later presented his dewpoint control system to the industry.

By 1911 he had worked out his rational psychrometric chart and formula which was invaluable to air-conditioning engineers of a quarter-century ago, and which has since served as the basis for the modern standard. This marked the beginning of far-reaching scientific experiments in the field.

### FIRST AIR WASHER

In 1905, the first air washer, or central station humidifier, was installed in a Charlotte, N. C., textile mill. In a few years central station humidifiers and air-conditioning equipment became common in textile plants of New England and the South.

During 1911, Mr. Carrier brought his air conditioner to the attention of the country's mechanical engineers in an address before the A.S.M.E. convention, during which he discussed the economic importance of the invention to all industries requiring controlled atmospheric conditions.

Twenty-five years ago, only three air-conditioning manufacturers were in the field: Carrier, the S. W. Cramer Co. of Charlotte, N. C., and Warren Webster & Co. of Camden, N. J. Today, more than 200 manufacturers of complete or partially complete air-conditioning systems and parts are active in the business, and new firms are springing up in the industry every year.

### INDUSTRIAL INSTALLATIONS

From 1911 until 1921, air-conditioning installations were almost entirely confined to industrial plants and a very few large theaters. Residential installations were practically unheard of, with the exception of a few summer cooling devices, operated mainly on the fan-over-ice principle, in the homes of wealthy individuals.

The application of electric refrigeration principles to the science of air conditioning, although not unknown to the field, awaited the advent of electric refrigeration expansion which began in 1926. Comfort cooling on a large scale has been realized only within the past 10 years.

### HUDSON JOB

In December, 1926, the J. L. Hudson department store, Detroit, installed three air-conditioning machines in the basement, forcing warm air from the main floors of the store through sheets of water and circulating the cooled and dehumidified air through ducts located at various points about the main floors. This was the first large store installation on record.

During the spring of 1927, 15

refrigerating machines were installed in the new Detroit-Leland hotel, one of which was used to circulate cooled air through the lobby, dining rooms, and ballroom of the hotel.

In May of the same year, L. L. Lewis, Carrier engineer, presented a paper on "Air Conditioning in the Theater" to an A.S.R.E. meeting in New York, and in November Mr. Lewis discussed "Recirculation in Theater Cooling" before the same group. At this time, refrigerating engineers visited the Roxy theater to witness the operation of the Carrier conditioning system there.

### THERMAL ENGINEERING

At the annual meeting of the A.S.R.E. in New York in December, 1927, Mr. Carrier predicted that modern homes of the future would be cooled in summer by the mere pressure of a button, and that a new division of the heating and ventilating engineering profession, called "thermal engineering," would be the outgrowth of air-conditioning progress in the household field.

Frank W. Smith, vice president of United Electric Light & Power, said at the time that 34 theaters in the New York Metropolitan area had been air conditioned during the past two years, and that "the big job ahead of us is . . . the proper ventilation and air conditioning of schools, crowded department stores, and office buildings, and of any other place where people come together in large numbers; it's as necessary to health and happiness as good lighting, either natural or artificial."

### MECHANICAL CONDITIONING

In a NEWS article in August, 1928, J. E. Bullard declared that mechanical air conditioning, operating on the electric refrigeration principle, was the only economical and sound solution to the problem of comfort cooling.

He stated that forced-draft cooling with fans circulating air through hot air pipes and gravity systems installed in attics was soon to be a reality.

Theater patrons in metropolitan areas had felt the effects of air conditioning and thus become interested in the new refrigeration marvel, but in the suburban districts "manufactured weather" was still something to be revealed only through the medium of newspaper stories.

The germ, however, had been planted in the public mind, and as electric refrigeration spread to the nation's homes, interest in an even more intimate comfort application of refrigeration spread with it.

### FIRST ROOM COOLER

Early in February, 1929, Frigidaire introduced the first unit room cooler to the public. E. G. Beichler, Frigidaire president, stated that in laboratory tests the unit had lowered room temperatures as much as 10 degrees in half an hour.

The machine, which stood four feet high and weighed 210 pounds, lowered room humidity through precipitation of excess moisture in the atmosphere, and circulated 450 cu. ft. of air per minute by means of a fan over cooling coils through which an electric motor pumped the refrigerant.

By this time, signs carrying the statement "20 Degrees Cooler Inside" were prominently displayed before several theaters in New York and other large cities.

The XL air conditioner for cooling homes appeared on the market during the summer of 1929 and was demonstrated to the A.S.R.E. convention.

At the November meeting of the Detroit A.S.R.E. section, H. Peacock, Carrier engineer, said that two systems of air conditioning had taken definite form: the central system used in cooling theaters, office buildings, and industrial establishments, and the self-contained unit systems for cooling one or more rooms in a home or office.

## 1930

In February, 1930, Carrier landed the contract for air conditioning the rebuilt White House Executive Building, which recently had been gutted by fire. Air ducts were built into the building as reconstruction progressed, this being the first large installation in which engineers had the opportunity to install an air-conditioning system "from the ground up."

Air was taken into the building through an outdoor intake, blown through a filter to remove foreign matter, forced through a chamber

(Continued on Page 26, Column 1)

## Detroit

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Offices	46	178.5	22	142.5	45	324.66	113	645.66
Physicians' Offices	0	0	0	0	4	6.25	4	6.25
Dentists' Offices	0	0	0	0	3	1.25	3	1.25
Office Buildings	2	960	1	250	1	225	4	1,435
Banks	3	600	0	0	2	65	5	665
Restaurants	18	498.5	10	116	10	145.75	38	760.25
Hotels	5	742	2	300	2	30	9	1,072
Clubs	1	60	0	0	1	120	2	180
Residences	34	80.75	14	26	105	112	153	218.75
Department Stores	5	3,513	3	1,715	4	2,160	12	7,388
Furniture Stores	1	12	0	0	1	260	2	272
Confectionery Stores	5	63.5	5	63	5	77.5	15	204
Ice Cream Stores	0	0	0	0	1	15	1	15
Drug Stores	5	57	1	15	3	37.5	9	109.5
Cigar Stores	0	0	1	3	0	0	1	3
Jewelry Stores	4	31	2	27	3	17.5	9	75.5
Opticians	2	2	0	0	0	0	2	2
Clothing Stores	3	23	0	0	5	54	8	77
Women's Apparel	8	95	3	47.5	6	115	17	257.5
Fur Stores	2	35	0	0	0	0	2	35
Shoe Stores	0	0	4	12	4	84	8	96
Markets	0	0	0	0	2	25	2	25
Electric Co. Sales Offices	3	39	1	20	0	0	4	59
Radio Stations	1	1.5	1	100	1	15	3	116.5
Radio Control Booth	0	0	0	0	1	0.75	1	.75
Theaters	17	3,715	0	0	4	195	21	3,910
Bowling Alleys	0	0	0	0	2	40	2	40
Library	1	5	0	0	0	0	1	5
Stock Exchange	1	50	0	0	0	0	1	50
Broker's Room	1	75	0	0	0	0	1	75
Pawnbrokers	0	0	0	0	1	2.5	1	2.5
Barber Shops	1	30	0	0	0	0	1	30
Beauty Shops	1	5	0	0	1	7.5	2	12.5
Hospitals	2	175	4	50.83	7	9.5	13	235.33
Undertaking Parlors	5	34	1	5	4	28	10	67
Research Laboratory	1	50	0	0	0	0	1	50
Engineering Laboratory	0	0	1	680	0	0	1	680
Exhibition Building	0	0	1	125	0	0	1	125
Automotive Mfg.	1	50	2	620	1	3	4	675
Roller Bearing Mfg.	1	50	0	0	0	0	1	50
Tool Manufacturing	0	0	0	0	1	5	1	5
Refrigerator Mfg.	0	0	1	10	1	45	2	55
Rubber Manufacturing	1	3	1	3	0	0	2	6
Drug Manufacturing	3	635	3	25.5	0	0	6	660.5
Candy Manufacturing	3	13.75	1	25	0	0	4	38.75
Mushroom Growing	0	0	1	10	0	0	1	10
Printing & Lithographing	1	20	2	6	1	.75	4	26.75
Motion Picture Production	0	0	0	0	2	15	2	15
<b>Total</b>	<b>188</b>	<b>11,902.5</b>	<b>88</b>	<b>4,397.33</b>	<b>234</b>	<b>4,242.41</b>	<b>510</b>	<b>20,542.24</b>

## Southern California Edison Co., Ltd.

Classification	Prior to 1935		During 1935		11 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Banks	0	0	2	6	5	23	7	29
Clubs	0	0	0	0	1	7	1	7
Doctors & Dentists	2	3	3	6.25	2	9	7	18.25
Hospitals	0	0	3	7.5	2	30	5	37.5
Industrial								
Citrus Packing Houses	14	839	27	740	14	654	55	2,233
Fur Storage	0	0	1	3	0	0	1	3
Mushroom Culture	0	0	1	15	3	86	4	101
Offices	2	26.5	7	13.25	6	54	15	93.75
Residences	0	0	6	15	10	20	16	35
Restaurants	1	7	2	3.5	9	89.5	12	100
Stores, Dept. & Retail	0	0	5	16	11	98	16	114
Theaters	1	70	0	0	8	433	9	503
Libraries & Museums	1	43	0	0	0	0	1	43
Motion Picture Studios	2	200	0	0	0	0	2	200
<b>Total</b>	<b>23</b>	<b>1,188.5</b>	<b>57</b>	<b>825.5</b>	<b>71</b>	<b>1,503.5</b>	<b>151</b>	<b>3,517.5</b>

## St. Louis, Mo.

Classification	Prior to 1935		During 1935		11 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Residences (including Apts.)	128	215.10	68	108.69	193	291.95	389	615.74
Apartment Houses	0	0	0	0	1	21.5	1	21.5
Banks	2	47.75	1	12.75	1	63.67	4	124.17
Beauty & Barber Shops	2	3.25	1	2.5	3	13.33	6	19.08
Brokers' Board Rooms	3	75.75	1	39.75	3	38.45	7	153.95
Clubs	1	9	3	117	4	140.81	8	266.81
Funeral Homes	3	25.5	5	84.93	3	72	11	182.43
Hospitals	1	.4	0	0	5	12.37	6	12.77
Hotels, Public Spaces and								
Guest Rooms	13	600.13	2	24.25	4	458.87	19	1,083.25
Office Buildings (Complete)	2	353	1	39	5	1,017.35	8	1,409.35
Offices	74	448.55	35	142.45	101	1,192.76	210	1,783.76
Restaurants and								
Liquor Dispensers	13	446.21	17	270.6	21	286.08	51	1,002.89
Sales & Display Rooms	17	96.86	8	13.45	11	41.63	36	151.94
Stores, Retail	25	625.3	25	382.4	47	2,159.06	97	3,166.76
Theaters & Auditoriums	10	2,736	5	1,611	14	463	29	4,810
Miscellaneous	7	29.63	2	795	5	229.75	14	1,054.38
Total Commercial								
Installations	173	5,497.33	106	3,535.08	228	6,210.63	507	15,243.04
Total Industrial								
Installations	20	888.7	13	364.39	10	386.65	43	1,639.74
<b>Total Air Conditioning</b>	<b>321</b>	<b>6,601.13</b>	<b>187</b>	<b>4,008.16</b>	<b>431</b>	<b>6,889.23</b>	<b>939</b>	<b>17,498.52</b>

## Baltimore, Md.

Classification	Prior to 1935		During 1935		11 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Barber Shops and								
Beauty Parlors	5	39	0	0	5	50	10	89
Drug & Confectionery Stores	6	95	13	154	4	38	23	287
Department Stores	7	888	6	540	3	381	16	1,809
Food Stores	5	20	1	13	0	0	5	33
Public Buildings	4	400	2	20	0	0	6	420
Hospitals	4	47	1	5	2	20	7	72
Industrial	9	494	2	110	2	9.5	13	613.5
Restaurants	18	310	11	309	10	203	39	822
Offices	26	220	20	302	13	242.5	59	764.5
Banks & Brokerage Houses	8	478	1	11	1	20	10	509
Residences	14	24	9	17	10	37	33	78
Specialty Shops	12	118	8	115	11	175.5	31	408.5
Theaters	21	2,358	11	633	9	369	41	3,360
Miscellaneous	7	90	3	168	6	53	16	311
Single Self-Contained Units*	0	0	15†	14†	33	40	33	40
<b>Total</b>	<b>146</b>	<b>5,581</b>	<b>88</b>	<b>2,400</b>	<b>108</b>	<b>1,635.5</b>	<b>342</b>	<b>9,616.5</b>

\*Input rating. †Prior to 1936.

## Boston Area

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Theaters	12	3,543.5	3	80	0	0	15	3,623.5
Restaurants, Bars, and								
Night Clubs	26	608.5	13	331.5	27	425.25	66	1,365.25
Residences	52	67	4	14.5	3	2.63	59	84.13
Beauty Shops & Barber Shops	4	69	1	5.5	0	0	5	



## Presenting the Complete '37 Westinghouse Conditioning Line



This novel stage setup was used by Westinghouse in displaying its complete 1937 line of air-conditioning equipment to distributors at their meeting in Mansfield. Said to be the largest amount of equipment ever shown by a manufacturer at one time, the equipment weighed 10 tons and represented a refrigerating capacity of 125 tons, enough to condition Westinghouse's new five-story office and warehouse building.

### Estimating Costs on Air-Conditioning Installations Discussed at Westinghouse Meeting

(Concluded from Page 23, Column 5) of the detailed estimate sheet at the time an order is entered. Our estimate sheets have an additional column in which the completed costs are inserted. Doing this makes it possible to compare the actual cost of each item with the estimated cost, as well as the total actual cost with the total estimated cost.

The fact that the total actual cost does not exceed the total estimated cost is no indication that the job has been accurately estimated. Some items may have exceeded the estimate and other items may have cost less and, if such is the case, the estimate has not been accurate. By careful cost keeping, the contractor will find his common errors and be able to correct them which will make for accuracy in estimating.

#### CLASSIFYING OVERHEAD

"Many contractors classify all items of overhead expense as general overhead. I do not consider this advisable. All of the overhead pertaining to labor should be kept separately and applied as 'burden' on labor. This includes such items as superintendence, tool expense, also rent, light and heat for that part of the premises required for storage of tools, and all other items of expense necessitated by the employment of labor.

"In making up the estimated cost of a job, burden on labor should be included as a separate item of cost. By doing this, the additional cost of handling labor will be included in the estimate and not considered part of the general selling and administrative overhead. The cost of drafting and engineering required for the execution of a contract should also be kept separate from the general overhead, and included in the estimate as an item of the cost.

"The cost of engineering is not always in direct proportion to the total cost of the job and by figuring drafting and engineering as an item of cost in the estimate, greater accuracy will result. Service should be included as an item in the estimate, for after the installation is completed, some free service is always required.

#### QUESTION OF SUB-DEALERS

"The establishing of sub-dealers under the distributor who is a contractor may be advisable in some cases, but this is largely dependent upon the territory to be covered. In the large metropolitan centers it is generally better for the distributor, with his contracting organization, to handle all of the work direct with the customer.

"There is comparatively little material the distributor could sell to the sub-dealer, and in order to make this sale, it would be necessary for the distributor to engineer the job and be morally responsible for its successful operation. If the sub-dealer falls down on any part of his work, the distributor would be compelled to protect himself by correcting all of the sub-dealer's errors.

"Air conditioning is principally a contracting business, and prospective customers do not call at your place of business. Therefore, it is not necessary to have the offices of the air-conditioning distributor located in an expensive office building or in a store

on the main street of the city where rents are high. The air-conditioning contractor can locate his business immediately outside of the heart of the city where he can have space at lower cost.

"Ample space is important, for, in addition to display room, offices, and drafting room, it is necessary to have storage space for tools and materials. Premises of this sort are easily air conditioned and several types of air-conditioning systems, including self-contained units, can be installed for display purposes as well as comfort.

"It is necessary for the contractor to carry a complete stock of repair parts, also fittings, tubing, valves and miscellaneous material constantly required in his regular business. Having this stock of material available permits prompt attention being given to service or repair work at any time, day or night.

"On contract work it also eliminates loss of time waiting for material to come from manufacturers. The store room should be large enough to enable the contractor to gather together material coming from out of town and forward it to the job when needed so that the mechanics can work without loss of time.

#### SIZE AND PROFIT

"The question frequently arises, are large or small installations most profitable. I do not feel that there is a definite answer to this question. It depends largely upon the contractor's organization and territory. If the contractor is located in a territory in which a fair number of contracts for large installations are available, and provided he has the organization to correctly engineer and install larger jobs, an effort should be made to obtain contracts for large installations as well as smaller ones.

"As a rule, there are not as many competitors on a large job as there are on a small one. Contracts for many of the larger jobs are placed in the fall and winter, whereas most of the smaller jobs are sold in the spring and early summer. If a contractor is able to handle both large and small work, he has a better chance of keeping his organization profitably employed during the entire year, and this is of vital importance.

"Although air conditioning has received a great deal of publicity during the past few years, I believe that the industry has not grown as rapidly as it should. This is due to the fact that the connection link between the manufacturers of equipment and the user must be an engineering and contracting organization, and at the present time, there are not enough thoroughly trained and experienced men available to engineer and handle this work.

#### MUST TRAIN MEN

"It is, therefore, necessary for the air-conditioning industry to train its men and this takes time and money. The air-conditioning industry will grow as fast as these men are developed. During the lean years through which we have recently passed, entirely too few young engineers recently out of college were employed and trained by the air-conditioning industry, with the result that there is now a shortage of experienced men.

"In order to have the money to make it possible to employ and train men, the air-conditioning contractor must obtain prices permitting him to carry on this important task. This means that air conditioning contracting must be done on a profitable basis. In order to carry on business successfully, the contractor must carefully engineer his work, install it economically, and know the cost of his jobs, including his overhead so that his prices will be right. Then, when he closes a contract, he will know that it includes a profit.

#### PUBLICITY GOOD

"The publicity that air conditioning has recently received has been good, but it must be continued. The public is gradually learning what air conditioning really means, and this educational work must be continued. Many people have been misled by the use of the words 'air conditioning' in

some of the recent advertising, but this is gradually being corrected, thanks to educational work being done by engineering societies, contractors' associations, and manufacturers of air-conditioning equipment.

"The advertising of air conditioning by manufacturers in national publications, as well as printed bulletins, etc., is of great value to the distributor. However, in addition to this, the distributor must do his share of advertising and publicity work. The nature of the distributor's publicity work is largely dependent upon his territory and organization.

#### ASSOCIATIONS HELPFUL

"Our company has found that memberships in trade associations and engineering societies are not only educational but very helpful in the promotion of sales. I strongly recommend that distributors and the members of their organizations who are qualified, should be members of the engineering societies.

"Most of the desirable air-conditioning contracts let in the Chicago territory during the past few years have been sold on a cash basis. Less than 1% of the business taken by our company was sold on time payments, and in these cases we used the FHA plan. While we do not object to selling air-conditioning installations on time payments, it is our opinion that many of the jobs that some of our competitors have sold on time payments could have been sold on a cash basis.

#### DON'T SELL PAYMENTS

"Some salesmen have been selling terms of payment rather than air conditioning. Selling jobs on a cash basis, especially where the terms call for payments as work progresses, greatly increases the amount of work the contractor can handle with his capital, and means a greater return on his investment.

"Frequently distributors for air-conditioning equipment start in business and immediately endeavor to promote sales of air-conditioning

installations, and their prices are generally low. What most of these organizations lack is trained engineers and trained construction personnel, with the result that they make a failure of the business. While such companies are unsuccessfully conducting their business, they are harmful to the air-conditioning industry.

"From the foregoing it will be seen that the air-conditioning contractor has a high overhead, greater than that of the average heating or ventilating contractor who generally figures on architects' and engineers' plans and specifications, and is not required to do the vast amount of engineering necessary in the air-conditioning industry.

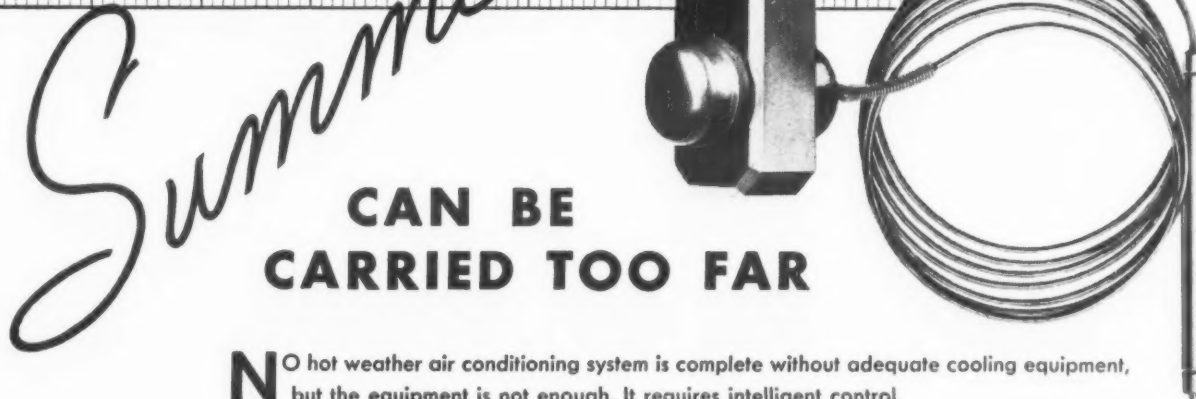
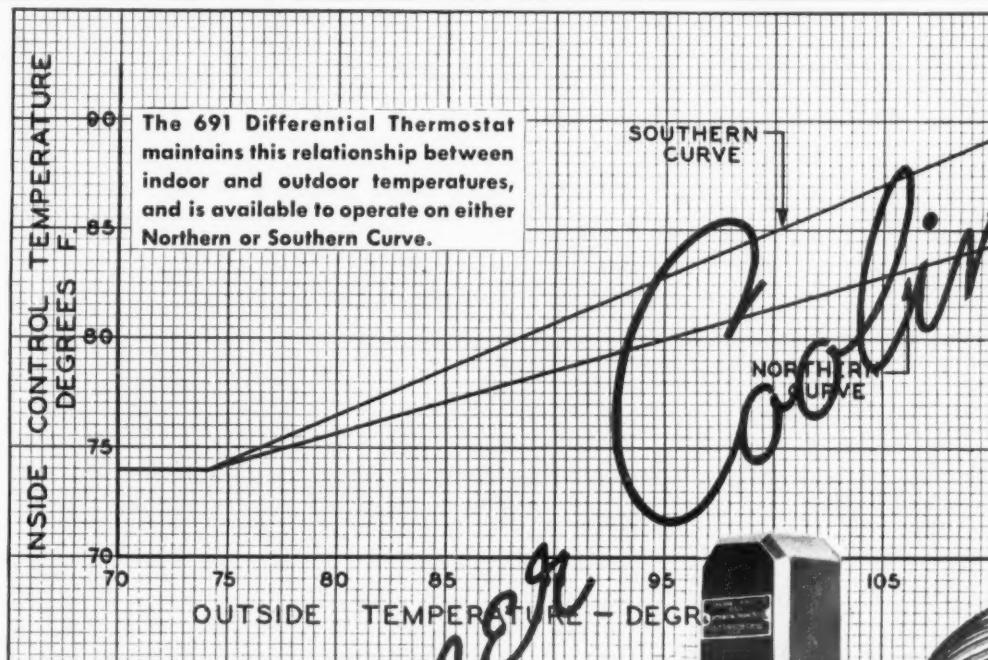
"I have outlined above some of my views on the operation of an air-conditioning business, the result of my personal experience, but they cannot be carried out without the proper personnel.

#### COLLEGE MEN NEEDED

"The engineering department must be made up of trained men having a college education or its equivalent, and in addition to this they require education and experience in air conditioning. The heads of the construction department must have similar training. The men selling medium or larger installations must also be competent air-conditioning engineers or men who have had considerable experience in the air-conditioning field.

"If they are not trained engineers they require assistance from an engineer who, in most cases, must accompany the salesman when interviewing the prospective customer. The small jobs and self-contained room coolers can be sold by the efficiently directed merchandising salesman.

"Let me repeat—let us take the young college trained engineers and make good air-conditioning engineers of them so that we can give the public the air-conditioning installations they need and want. By doing this we will be building up profitable contracting business for ourselves."



**N**O hot weather air conditioning system is complete without adequate cooling equipment, but the equipment is not enough. It requires intelligent control.

When the temperature on the street is 80°, a room temperature of 75° is comfortable. But when it is 90° outside and you enter a room held at 75°, the sudden shock leaves you cold and very uncomfortable. Over-cooling has been the cause of summer colds and perhaps other complaints.

There is a definite relationship between comfortable indoor and outdoor temperatures during the hot weather. Your air conditioning systems should maintain that relationship if they are to provide comfort and operate economically.

You can be sure of this when you assign that job to the "Genuine Detroit" Differential Thermostat No. 691. This instrument automatically holds indoor temperatures in accordance with the A.S.H.V.E. comfort curve (above)—automatically maintains just the proper difference between room and street temperatures. And it is an inexpensive instrument, easily installed.

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## Refrigeration Manufacturers Started to Actively Promote Air Conditioning Sales During 1931 and 1932

(Continued from Page 24, Column 3) containing atomized water where the desired temperature was controlled, and finally circulated through air ducts in rooms.

A Carrier centrifugal refrigeration unit supplied the equivalent of 30 tons of ice per day, and a relative humidity of 50% was maintained. The system was a year-round conditioner, using warm air in winter.

The Peerless Ice Machine Co., of Chicago, brought out a unit conditioner in April. This machine drew air into one side of a suction fan, condensed excess moisture, and propelled a cool, dry breeze through the "duct" side.

### CARRIER MERGER

The industry's first great merger was consummated in November, 1930, when Carrier Engineering Corp., Newark, the Brunswick-Kroeschell Co., New Brunswick, N. J., and the York Heating and Ventilating Corp., Philadelphia, united 15 companies in all parts of the world with total assets of \$15,000,000 under the name of the Carrier Corp.

In combining air conditioning, refrigeration, and heating and ventilating companies, the new firm announced itself ready to supply air conditioning to all parts of the world.

## 1931

Several industry leaders declared that house and room cooling were to be refrigeration features of 1931 in statements published in the NEWS in January, 1931. Others announced themselves as interested in the new field, and definite signs of established electric refrigeration companies preparing to enter air conditioning were noticeable within the industry.

During 1931, installation of air-conditioning systems in railroad passenger cars and pullmans brought comfort cooling several steps nearer public acceptance.

In March, the Baltimore and Ohio air conditioned diners, club, observation, and chair cars on its "Columbian" running between New York and Washington, D. C., and during September Carrier introduced a railroad-car air-conditioning system employing steam from the engine as the sole refrigerating energy.

Within a few months, several railroads had started air-conditioned cars on regular runs, and advertised the new service widely to the public.

### HEALTH ASPECTS

W. E. Landmesser, G-E commercial division manager, in a REFRIGERATION NEWS article stated that air conditioning was gaining recognition as a health benefit and that physicians had discovered that hay fever victims improved considerably when placed in air-conditioned rooms. Mr. Landmesser predicted the approach

of the day when healthful climates for the sick could be produced in their own homes.

At a February meeting of the Midwest Power Engineering Conference, A. E. Stacy, Carrier research engineer, said that his company was producing air conditioners which cooled, warmed, cleansed, and humidified the air. He advised public utilities to prepare for large increases in power loads due to added air-conditioning installations and predicted that whole urban districts would soon be cooled by means of central systems.

Large central system installations were made during the spring months in the May department store, Cleveland, and in Higbee's store in the same city. Both systems circulated several hundred thousand cu. ft. of air per minute.

The "New York News" installed a central system in its paper storage rooms, and the first steamship installation was made on the S. S. "Mariposa," sailing between Pacific coast ports and Australia.

Production of small units was given added impetus by steadily increasing home installations. Frigidaire gave its line of room coolers an extensive advertising campaign and brought out a dehumidifier. Carrier entered the small unit field in April, and west coast manufacturing began with the production of the Frigzone unit by the Smoot-Holman Co., of Inglewood, Calif.

### FRIGIDAIRE SYSTEM

In July Frigidaire joined production forces with the General Iron Works Co., of Cincinnati, to put the Hot-Kold year-round air conditioner on the market. This system supplied complete summer and winter air conditioning to small homes of from six to eight rooms.

Willis H. Carrier, in a NEWS article published in May, estimated that 300 theaters already had been equipped and that 3,000 more were in need of air conditioning, that only 20 departments stores of more than 500 of large size had made installations, and that the air-conditioning business would soon reach a \$250,000,000 per year volume.

REFRIGERATION NEWS conducted a spring survey of installations throughout the country, and estimated that 40,000 tons of air-conditioning refrigeration was being used in industrial plants, and 75,000 tons in homes.

### FACTORY INSTALLATIONS

Dry-Zero installed large central systems in its fiber insulation manufacturing plants, and the Simonds Saw and Steel Co., Fitchburg, Mass., constructed a completely air-conditioned windowless factory.

Copeland introduced a room cooler at its distributor convention in July, and Kelvinator entered the field in August with a series of cabinet type

units for homes and offices. Carrier brought out in September a "Weathermaker" using gas fuel.

The Ilg Electric Ventilating Co., Chicago, brought out its "Ilg-Kold" line in December, and much favorable publicity was given Frigidaire room coolers when units originally ordered for Otto H. Kahn were delivered to the sick room of Thomas Alva Edison, who manifested keen interest in the installation.

### GOVERNMENT JOBS

Engineers connected with the new government building construction in Washington, D. C., estimated that \$300,000 would be spent for air conditioning for each \$10,000,000 of construction in the six buildings being erected.

Statisticians at the December convention of the National Warm Air Heating Association estimated that there was a \$5,000,000,000 market for air conditioning in 25,000,000 U. S. homes, which awaited only lowered installation costs for active development.

Numerous installations in food-serving establishments, offices, dairies, ice cream plants, packing houses, tobacco factories, printing plants, textile mills, theaters, and many other places were reported to the NEWS during 1931, and the year closed on an optimistic note for air conditioning.

## 1932

In a survey conducted by the Carrier Corp. at the outset of 1932, it was estimated that air conditioning had been installed in about 400 theaters, 20 office buildings, 25 department stores, 30 banks, 50 restaurants, and 20 hotel dining rooms.

No accurate figures could be obtained in the number of residential installations made to date, but authorities agreed that a substantial increase had been made in the year just past.

Manufacturers of air-conditioning equipment took definite strides ahead in 1932, in both development and sales activities. Although sales of air-conditioning equipment were hindered by general business conditions, a relatively large number of sizable installations were made, and the companies which began producing this type of equipment were many.

Some idea of activity in the field of air conditioning during 1932 may be had from this resumé of events in the industry:

### STEAM SYSTEM

In January, the Atchison, Topeka, and Santa Fe Railroad equipped 10 diners on transcontinental trains with Carrier air conditioning systems employing steam as the refrigerating energy, and water as the sole refrigerating medium.

During the same month, Frigidaire introduced a line of unit air conditioners for commercial and household installation. When the joint A.S.R.E.-A.S.H.V.E. convention was held in Cleveland in January, air conditioning was the subject of much consideration. Frigidaire's new air-conditioning equipment was displayed during the convention.

Conditioned Air Corp. was organized in Detroit early in February to install residential air-conditioning systems, and the new company announced its Airco central air-conditioning system.

Carrier Research Laboratories introduced, in March, a new humidifying device to work in conjunction with household radiator heating systems.

### REVERSED REFRIGERATION

A cooling and heating system, operating on the reversed refrigeration cycle, was installed in Los Angeles' Southern California Edison Co. building about that time.

Racine's Young Radiator Co. announced a line of unit coolers, the American Radiator Co. introduced its "Cascade" humidifiers, and the A. C. Gilbert Co., New Haven, Conn., toy manufacturers, brought out a line of electric humidifiers.

Late in the same month, York Ice Machinery Corp. announced an individual all-electric air-conditioning and refrigerating system for railroad passenger cars, using storage batteries for power and Freon as the refrigerant.

On March 23, Carrier Engineering Corp. gave a demonstration of uses of the steam ejector system of air conditioning for retail store installations.

In April, York Ice Machinery Corp. (Continued on Page 28, Column 1)

## Pittsburgh, Pa.

Classification	Prior to 1936 No.	During 1936 Hp.	10 Mos., 1936 No.	During 1936 Hp.	Total No.	Total Hp.
Banks	0	0	1	500	0	1
Barber Shops	0	0	2	14	4	74.75
Beauty Shops	0	0	4	55.50	2	8.50
Combination Barber and Beauty Shop	0	0	1	18	0	1
Candy Stores	0	0	0	0	10	16
Dairy Stores	2	11	2	18	0	4
Department Stores	1	590	0	0	1,115	2,705
Federal Parlors	1	7	0	0	2	10
Hospitals	0	0	0	0	2	1.50
Hotels	0	0	3	73	4	210
Coffee Shops	0	22	1	3	5	77
Tap Rooms	0	0	1	30	0	1
Ball Rooms	2	2.50	1	1.50	1	5
Guest Rooms & Offices	35	120.50	16	52.25	28	181
Offices (General & Private)	4	3.75	4	6	4	5.75
Offices (Doctors)	13	14.75	25	33	25	40.75
Residences	9	320.50	10	260	11	173.50
Restaurants & Cafeterias	11	130.50	13	102.25	8	354.50
Stores (Miscellaneous)	7	2,377	2	170	2	78
Theaters	4	523	4	65	4	33.50
Industrial	2	58	1	11	3	11
Miscellaneous	2	58	1	11	3	11
<b>Total</b>	<b>92</b>	<b>4,180.50</b>	<b>92</b>	<b>1,412.50</b>	<b>113</b>	<b>2,319.50</b>

## Milwaukee, Wis.

Classification	Prior to 1935 No.	During 1935 Hp.	11 Mos., 1936 No.	During 1936 Hp.	Total No.	Total Hp.
Residential	3	13.5	0	0	7	12
Funeral Homes	5	46	0	0	4	28.75
Hospital Rooms	0	0	0	0	1	.75
Office Buildings (Private)	1	300	3	75	1	20
Offices	9	16.6	6	14.5	11	41.5
Physicians' Offices	0	0	0	0	2	1.75
Broadcasting Studios	0	0	0	0	1	7.5
Beauty Parlors	0	0	0	0	1	15
Cocktail Bars	0	0	0	0	2	20
Hotel Coffee Shops and Dining Rooms	0	0	0	0	2	55
Restaurants	4	75	1	10	2	15
Department Stores	0	0	0	0	3	240
Apparel Stores	1	3	4	69	4	33
Drug Stores	0	0	0	0	1	15
Food Stores	2	10.5	0	0	2	1.75
Schools	0	0	0	0	1	0
Banks	1	40	0	0	0	1
Brokerages	1	6	0	0	0	1
Hotels	2	115	1	135	0	3
Recreation	1	40	0	0	0	1
Taverns	2	11.75	3	17.5	1	20
Self-Contained Units	6	10	3	7	10*	7.5*
Theaters	8	1,600	0	0	0	8
<b>Total</b>	<b>46</b>	<b>2,297.35</b>	<b>21</b>	<b>328</b>	<b>56</b>	<b>534.5</b>

\*Six months only. †No refrigeration hp.

## Washington, D. C.

Classification	Prior to 1935 No.	During 1935 Hp.	During 1936 No.	During 1936 Hp.	Total No.	Total Hp.
Bakeries	4	46.5	0	0	0	4
Banks	0	0	1	25.5	1	6.25
Barber and Beauty Shops	2	13	1	11	6	47.5
Bowling Alleys	1	3	1	15	1	16.5
Candy Mfg.	1	3	0	0	0	1
Churches	1	48	1	61	0	2
Clubs	0	0	0	0	2	9.5
Department Stores	8	409.25	6	1,097	4	1,151.25
Dress Shops	1	8.5	4	49	7	128
Drug Stores	4	58	5	147.5	10	132.5
Exhibits & Displays	6	21.25	0	0	0	6
Five & Ten Cent Stores	3	303	3	216	2	333.5
Funeral Parlors	1	15	1	12.25	1	5.5
Fur Shops	3	28.5	2	2	0	7
Grocery Stores	1	3	0	0	0	1
Haberdasheries	1	6	1	11.5	8	134.5
Hospitals	2	118	1	43.5	0	3
Hotel Dining Rooms and Cocktail Rooms	10	711	7	122.75	2	13
Hotel Guest Rooms	1	51	1	108	5	1,055
Interior Decorators	0	0	0	0	1	4.5
Jewelry Stores	0	0	6	50.25	4	48.5
Leather Goods	0	0	1	23.5	0	1
Libraries	1	28	0	0	0	1
Linen Stores	0	0	1	6	0	1
Market Spaces	2	3	1	1.5	0	3
Meat Processing	1	16.5	0	0	0	1
Millinery Shops	0	0	1	8.5	1	8.5
Novelty	0	0	0	0	1	17
Office Buildings	3	1,082.5	2	694.75	3	584.25
Opticians	1	2	0	0	0	1
Printing Establishments	2	90	0	0	0	2
Private Offices	17	43.25	23	111.5	26	105.25
Radio Studios	1	10	1	2.25	0	2
Residences	24	53.5	36	82.75	39	37.25
Restaurants	26	653.25	17	267.75	22	397.75
Schools	0	0	0	0	1	3
Shoe Stores	6	42.5	8	93.5	7	49.75
Theaters	5	2,032	6	531	8	399.5
Wine & Liquor Stores	1	2	0	0	0	1
<b>Total</b>	<b>140</b>	<b>5,904.5</b>	<b>138</b>	<b>3,735.25</b>	<b>162</b>	<b>4,688.25</b>
Federal Government	37	14,652.5	21	4,898.75	6	5,563
<b>Total</b>	<b>177</b>	<b>20,557</b>	<b>159</b>	<b>8,634</b>	<b>168</b>	<b>10,251.25</b>

## New Orleans

Classification	Prior to 1935 No.	During 1935 Hp.	During 1936 No.	During 1936 Hp.	Total No.	Total Hp.
Airports	1	105	0	0	0	1
Beauty Shops	0	0	1	.5	1	7.75
Broker Rooms	1	10.5	1	5.25	1	48.13
Cake Mfg.	1	12	0	0	0	1
Candy Mfg.	2	83.5	0	0	0	2
Children's Wear	0	0	1	5.5	0	1
Cigar Mfg.	2	2	0	0	0	2
Clothing Stores	2	33	2	40	3	306
Colleges	2	4.25	0	0	0	2
Court Rooms	0	0	1	55	0	1
Department Stores	4	1,813	0	0	3	449.3
Drug Stores	0	0	1	1.5	3	83.32
Funeral Homes	0	0	1	25	1	30.3
General Offices	5	94.5	6	31.85	5	53.5
Hospitals	2	14.5	0	0	1	25
Hotels	7	446.25	3	175	3	111
Laboratories	2	43.5	0	0	0	2
Night Clubs	0	0	1	24	1	51
Office Buildings	1	516	2	1,353	0	3
Pecan Dryers	2	1.5	0	0	0	2
Printing Establishments	2	4.9	0	0	0	2
Private Offices	8	11.5	8	7	22	17.2
Radio Studios	2	26.5	0	0	0	2
Residences	26	83.5	24	88.28	28	45.29
Restaurants	3	101.25	3	176.91	5	59.84
Seed Storage	0	0	1	16	0	1
Shoe Stores	3	22.5	3	52	2	20.75
Stores (5 & 10 Cent)	0	0	1	117	0	1
Sugar Storage	1	1	0	0	0	1
Telephone Exchange	0	0	2	6	0	2
Theaters	4	1,442	2	109	0	6
Utilities	1	4.5	0	0	0	1
Women's Apparel	6	187	2	39	4	42.5
Railroads (service for cars)	0	0	5	380	0	5
<b>Total</b>	<b>90</b>	<b>5,064.15</b>	<b>68</b>	<b>2,481.79</b>	<b>86</b>	<b>1,576.88</b>

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## - AIR CONDITIONING ENGINEERING -

### Heat Transfer Phases of Design Problem On Evaporative Condensers Discussed By James; Rating Method Suggested

NEW YORK CITY—Heat transfer phases of the design problem in unit refrigerant condensers which use evaporative cooling, with suggestions for a simple rating method based on condensing temperature and heat content of the entering air, were outlined by Byron E. James, assistant research engineer, York Ice Machinery Corp., at the annual convention of the American Society of Refrigerating Engineers last month here.

Development of the unit refrigerant condenser using evaporative cooling was slow because condensing water at first was plentiful. The introduction of mechanical air conditioning for railroads in 1929-1930 provided an incentive for research work on the subject, Mr. James stated.

It was imperative that some means be found to reduce the temperatures normally occurring in air-cooled condensers, otherwise the equipment involved would be prohibitively heavy, since straight water-cooled condensers were impractical for this application.

The solution of the problem was a unit in which quantities of water were recirculated and sprayed into the air stream.

Some well known designs of portable air-cooled self-contained air conditioners, said Mr. James, make use of the evaporative cooling principle in their condenser arrangements.

Moisture condensed out of the evaporator air stream is re-evaporated in the condenser air stream. Physically, condensers smaller than those required for straight air cooling are adequate for this duty, and at the same time, lower condenser pressures with resultant lower operating costs are obtained.

Mr. James declared that his discussion fixing values of coefficients was based on hundreds of tests made on many units. The discussion was confined to the refrigerant, "Freon-12," and to bare pipe units.

Design conditions of 110° F. condensing and 78° F. entering wet bulb temperature were assumed.

#### MECHANISM INVOLVED

The mechanism of the heat transfer involved in each process has been understood for some time, but it is of special interest now due to the rapid increase in unit installations, said Mr. James in calling attention to Fig. 1, showing a typical unit and a section through a pipe wall.

In the unit a perforated drum revolving at high speed acts as a pump and throws a water spray upward in front of the coil so that the moving air can thoroughly wet the surface by carrying this spray with it.

The air surrounding the coil is saturated with moisture so that its wet bulb is equivalent to its dry bulb, and also its dew point temperature. Although air may enter the unit at a normal wet bulb depression, the air entering the coil will be practically saturated at the entering air wet bulb temperature due to adiabatic cooling in the spray chamber.

"It is therefore logical," declared Mr. James, "to use a mean temperature difference based on condensing temperature inside the coil and wet

bulb temperature outside the coil. Note that the wet bulb temperature rises logarithmically as the air travels through the unit.

"To emphasize the importance of wet bulb temperature the logarithmic mean temperature difference is called wet bulb m.t.d. and the heat transfer units is called wet bulb K. Wet bulb K has been used successfully in the analysis of coil performance in hundreds of tests."

Starting inside the pipe and tracing the heat flow to the outside air three different thermal resistances are encountered in the following sequence, Mr. James explained:

A. That offered by the condensate film inside the pipe

( $\frac{a_2}{a_1 h_1}$ )

B. That offered by the pipe wall ( $\frac{1}{k}$ )

C. That offered by the moisture and by the moisture and air films on the outside of the pipe ( $\frac{1}{h_2}$ )

$a_2$ —External coil surface in sq. ft.

$a_1$ —Internal coil surface in sq. ft.

$h_1$ —Internal film coefficient in heat transfer in B.t.u./hr./°F./sq. ft. external

surface.  $\frac{1}{h_2} = \frac{1}{h_2} + \frac{1}{h_2}$

$h_2$ —A component of the external film coefficient of heat transfer in B.t.u./hr./°F./sq. ft. of external surface—water film outside of pipe.

$h_2$ —A component of the external coefficient of heat transfer in B.t.u./hr./°F./sq. ft. of external surface—water to air film outside of pipe.

$l$ —Pipe wall thickness in inches.

$k$ —Thermal conductivity of the pipe wall material in B.t.u./hr./°F./sq. ft./in. of thickness.

$K$ —Overall coefficient in heat transfer in B.t.u./hr./°F./sq. ft. of external surface.

$x$ —Extended or fin surface efficiency. Temp. difference between the air and the effective average fin temperature

=Ratio Temp. difference between the air and the fin temp. at its base.

The above described flow through the various resistances can be represented by the formula:

$$(1) \text{ Wet bulb } K = \frac{1}{\frac{a_2}{a_1 h_1} + \frac{1}{k} + \frac{1}{h_2}}$$

This formula can be used for both bare pipe and fin surface, but Fig. 1 applies to a bare pipe coil where  $x=1.0$

Comparative magnitudes of the various resistances, Mr. James pointed out, are shown graphically in this figure by the temperature gradient through the pipe wall and surrounding films. A listing of the resistances in the order of increasing importance would be as follows:

1.  $\frac{1}{k}$ , the pipe wall resistance
2.  $\frac{a_2}{a_1 h_1}$ , the internal film resistance
3.  $\frac{1}{x h_2}$ , the external film resistance

According to Mr. James, pipe wall resistance using iron pipe or copper tubing is so insignificant in magnitude that it can be neglected in a practical study. For instance, when using  $\frac{3}{4}$  inch F.W. iron pipe where  $l=0.113$  in. and  $k=360$

(approx.) an  $\frac{1}{k}$  value of 0.000314 results.

If copper tubing were used with  $l=0.049$  in. and  $k=2500$  (approx.) the resistance would be even more insignificant.

The internal film coefficient ( $h_1$ ), it was stated, has a wide range of values depending upon design and operating conditions. In practice and under normal operating conditions  $h_1$  ranges from 160 to 300 for an average of 230. Both higher and lower values have been obtained but it is believed that the above figures cover the average working range adequately. The following factors, more or less within the control of the designer, have a modifying effect on  $h_1$ .

a. Refrigerant velocity which should be kept as high as possible without resulting in serious refrigerant pressure loss.

b. Hydraulic radius of the tube with the smaller tubes having the advantage.

c. Roughness of internal surface with the rougher surface creating more turbulence and higher heat transfer but at the same time creating more pressure loss.

d. Drainage of condensate with a well drained coil being superior.

### Typical Unit & Section through Wall

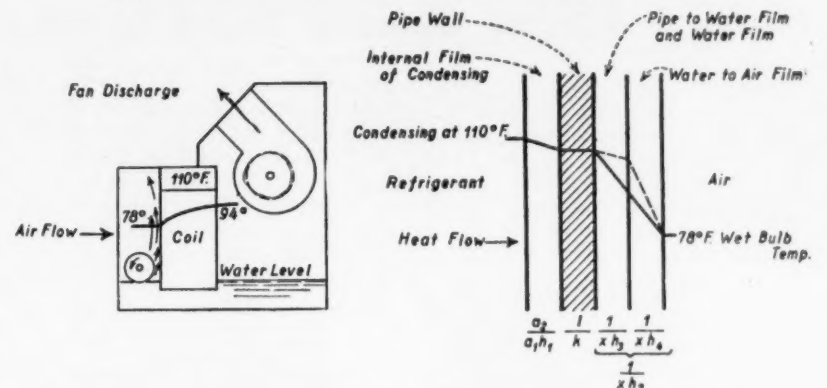


Fig. 1. (Left) A typical unit. (Right) Temperature gradient through a bare pipe wall.

e. Mean temperature difference, the coefficient increasing with m.t.d.

In addition, the presence of non-condensable gases and other impurities has a marked effect on this coefficient. However, the factors listed above as controlling  $h_1$  are not peculiar to this type of unit but are common to all air-cooled condensers. In view of this fact discussion of the internal coefficient is limited to the above statement of values and controlling factors.

Fig. 1 shows that the internal resistance is not so important as the external resistance in bare pipe units, and changes in the value of  $h_1$  have comparatively little effect on the overall K.

External resistance,  $\frac{1}{h_2}$ , can be broken down into two components,

$\frac{1}{h_2}$ , and  $\frac{1}{h_2}$ . It is this resistance  $\frac{1}{h_2}$  which is the major part of the total resistance, and which is the one to be lowered if appreciable improvement in heat transfer is to be obtained.

The water to pipe coefficient,  $h_2$ , will range normally from 250 to 1,000+ depending upon the following factors:

a. Water quantity.  
b. Efficiency of surface coverage which depends partly on quantity and partly on method of water distribution.

The water to air coefficient,  $h_2$ , will range from 70 to 100 in a well designed unit and will depend upon the following factors:

a. Relative air and water velocities—and air turbulence.  
b. Vapor pressure difference.  
c. Water quantity.

The external coefficient,  $h_2$ , a combination of  $h_2$  and  $h_2$ , will range from 60 to 90 and will be more affected by those factors controlling  $h_2$  than by those controlling  $h_2$ .

#### EFFECT OF QUANTITY

Water quantity will have an effect on both  $h_2$  and  $h_2$ , said Mr. James. Increased water quantity will tend to increase  $h_2$  since a higher flow rate over the tubes will be obtained. But as  $h_2$  is already 250 more, the effect of increasing the water quantity above a certain point will be negligible in respect to overall performance.

That certain point, it was explained, is the amount of water needed to wet the outer surface of the tubes completely with a thin film of water, and obviously is the very minimum quantity that would be required.

"Increased water quantity," continued the York engineer, "will tend to increase  $h_2$ , the water to air coefficient, since a higher relative air and water velocity will be obtained and more water surface will be offered as diffusion surface."

"But as in the case of  $h_2$  its effect on  $h_2$  is not pronounced above a certain minimum quantity. Test data

(Continued on Page 29, Column 1)

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The complete line of Perfection Products includes VALVES, FITTINGS, TOOLS and COMPRESSOR

PARTS. These compressor parts are not limited to a single make, but are available for Copeland, Frigidaire, Kelvinator, Servel, Universal, Zerozone and others.

To be sure of dependable performance—it pays to look for the Perfection emblem when purchasing refrigeration parts.

**PERFECTION REFRIGERATION PARTS CO.**  
(A division of Perfection Gear Company . . . Established 1919) HARVEY, ILLINOIS

Table 1—Change in Heat Transfer with Water Quantity

Run No.	Entering dry bulb, °F.	Entering wet bulb, °F.	Air quantity, c.f.m.	Water recirculated, gal./min.	Condensing temp., °F.	Per cent K value
41	89.6	77.5	4308	2.5	103.0	75.5
42	91.8	78.1	4273	4.95	103.1	84.4
43	91.0	78.0	4456	10.05	103.1	98.2
43	90.2	78.3	4280	14.25	103.1	100.0

Table 2—Change in Heat Transfer with Air Quantity

Run No.	Entering dry bulb, °F.	Entering wet bulb, °F.	Air quantity, c.f.m.	Water recirculated, gal./min.	Condensing temp., °F.	Per cent K value
1A	84.4	78.15	1901	17.8	110.3	71.8
6A	81.15	78.3	2780	17.8	110.2	85.4
7A	80.75	77.85	3830	17.8	110.2	100.0

Table 3—Change in Heat Transfer with Changing Condensing Temperature  
(Data from Two Different Design Units)

Run No.	Entering dry bulb, °F.	Entering wet bulb, °F.	Air quantity, c.f.m.	Water recirculated, gal./min.	Condensing temp., °F.	Per cent K value
18A	97.10	78.05	3570	17.4	90.3	88.3
9A	79.95	77.85	3730	17.5	100.3	94.4
8A	80.0	78.22	3820	17.8	114.0	100.2
7A	80.75	77.85	3830	17.8	110.0	100.0
81A	79.3	64.5	1450	constant	90.3	90.5
79A	78.5	63.95	1455	constant	100.0	96.5
77A	82.1	63.65	1451	constant	110.2	100.0



## Sales of Air-Conditioning Equipment Showed Snappy Upward Trend in 1933

(Continued from Page 26, Column 3) introduced a new line of unit air coolers for ceiling suspension.

Carrier Engineering Corp. was given the contract for installation of air-conditioning systems in the two theaters under construction in Rockefeller Center, New York City.

### G-E ENTERS FIELD

An air-conditioning department was instituted in April by the General Electric Co. Its first product was an oil-burning furnace with humidifying device.

First completely air-conditioned train to be run by the Chesapeake and Ohio Railroad took its maiden trip April 24.

Following month, Carrier Engineering Corp. announced that it had licensed the Canadian Blower and Forge Co. in Kitchener, Ont., to make air-conditioning systems for sale in Canada.

First week in May Frigidaire Corp. started full time production of air-conditioning equipment for domestic and commercial use. Later the same month, Toledo's Swartzbaugh Mfg. Co. introduced the "Klenzair" portable air-washing fan, and Carrier Research Laboratories announced a portable air-cooling unit using melting ice as the cooling medium.

### MERCHANDISABLE UNITS

Engineers of Carrier Corp. on June 27 demonstrated to a group of radio and refrigeration distributors that certain types of air-conditioning equipment had been developed to the high point where they could be sold by specialty merchandising outlets. Carrier also put out on test several of its railroad car pre-coolers, which used melting ice as the refrigerating medium.

By the middle of the summer all dining cars of the Union Pacific Railroad, and all cars on Illinois Central trains running between Chicago and St. Louis, were equipped with air-conditioning systems. Westinghouse systems were used in 10 of the I. C. cars.

During the week June 25 to July 2, 200 Frigidaire dealers gave demonstrations of air-conditioning systems, and McCord Radiator & Mfg. Co. announced a new overhead air-cooling unit. American Blower Co. began production of unit air-conditioning systems, in addition to its central type unit.

### SALES JUMP

A two-week air-conditioning show was held in July by the Commonwealth Edison Co., Chicago. During the show it was announced that sales of air-conditioning systems by members of the Refrigeration Division of N.E.L.A. for the first six months of 1932 were 222% of sales for all of 1931.

L. J. Mueller Co., Milwaukee, began production of the "Climator II" unit for heating, cleaning, circulating, and humidifying the air. Williamson Heater Co. of Cincinnati announced that its air conditioners, originally built to heat, ventilate, clean, and humidify air, could now be equipped to cool and dehumidify the air.

National Korecator Sales Co. of Chicago made plans to extend its line of air-conditioning equipment. Fairbanks, Morse & Co. announced a line of motors and generators made

especially for air-conditioning systems on railroad passenger cars.

Edwards Mfg. Co., Cincinnati, introduced the Hot-Kold central heating system to clean, heat, humidify, and circulate air in residences. In August, plans were made public for an extensive air-conditioning exhibit at the World's Fair in Chicago during 1933.

### NEW SERVEL UNIT

Servel engineers announced a new cooling cabinet for domestic and commercial use. George Bright and his associates completed design of a portable ice cooler for the Ohio Galvanizing & Mfg. Co.

Campbell Metal Window Corp. of New York City began manufacture of equipment to perform not only the six usual functions of air conditioning, but also to eliminate noise from rooms in which it was installed.

Cleveland's Corozone Co. introduced its DeLuxe Aquazone air conditioner. Lewis Air Conditioners, Inc., Minneapolis, revealed that its Humitrol was being used by 40 manufacturers of air-conditioning equipment.

H. J. Somers, Inc., of Detroit placed on the market a humidistat, a portable ice cooler for railway dining cars, and an automatic humidifier and air washer.

### WESTINGHOUSE SETUP

In August, Westinghouse Electric & Mfg. Co. announced establishment of an entirely new department to handle engineering, development, and sales of air-conditioning equipment. Later in the year, the Buffalo Forge Co. introduced a portable room cooler.

Frigidaire Corp. announced its entrance into the field of air-conditioning equipment for railroad cars, Dec. 14.

Late in the month, Westinghouse Electric & Mfg. Co. placed a new portable electric humidifier on the market.

As air conditioning progressed, more manufacturers entered the field. Selling the product to the consuming public became a major problem, and difficulties arose to confront the infant industry.

### ENGINEERING PROBLEMS

Unlike electric refrigeration at the same stage of development, air-conditioning installations involved major engineering problems. Most electric refrigerators could simply be plugged into a base plug and were ready to operate after a few simple adjustments and connections.

Not so with an air conditioner, and much less so with a complete central system. Carefully made calculations and estimates were required in advance, and after ducts were placed and the system set up, mistakes brought costly changes and owner complaints.

Air conditioning men saw that the industry could be made or broken on the reputation for service, installation costs, and performances registered during the early days of its history.

Most manufacturers demanded that not only engineers but salesmen be thoroughly schooled in the construction, principles, capacities, and functions of the system they were promoting. Specialty selling was an integral part of the industry from its

earliest days. Such companies as Frigidaire and G-E exercised strict control over distributor-dealer outlets from the outset.

## 1933

Marked by an unusually large number of companies entering the field, 1933 showed a sharp upward trend in air-conditioning sales despite the fact that the year proved to be the worst of the depression in most other branches of business.

In January, Pictorial Review's model home in the John Wanamaker store auditorium in New York was completely air conditioned, and was inspected by thousands of people interested in residential comfort cooling.

Laboratory uses of air conditioning for construction projects gained attention in February, when York conditioning was installed in Boulder Dam experimental laboratories at Denver, to produce extremes of climatic conditions on concrete used in the dam. York also secured that same month a contract to air condition the new National Archives Building in Washington, D. C.

### PARTS ACTIVITY

Activity among parts manufacturers became noticeable when the Wagner Electric Corp., St. Louis, introduced a line of motors especially adapted for small air-conditioning units, and Fee & Stenwedel, Inc., Chicago, started production on the "Airguide" temperature and relative humidity indicator for domestic and office installations.

Detroit Edison announced a co-operative sales promotion policy to a meeting of 400 dealers in February, stating that load building was the utility's sole interest in the field.

Location of wall ducts at least seven feet from the floor was recommended in preference to baseboard outlets at a meeting of the A.S.H.V.E. in New York.

Frigidaire held a five-day school for its air-conditioning distributors and dealers as the month closed. April became "new model month" of the year when 11 manufacturers announced their new units for the season.

### NEW ILG LINE

The Ilg Electric Ventilating Co., Chicago, brought out its Ilg-Spot-Kooler in a self-contained unit. American Blower Corp., Detroit, introduced its ice-cooled Sirocco pre-coolers for railroad cars. G-E and the Campbell Metal Window Corp. combined production on units with window intakes.

Westinghouse started production on 1, 2, 4, and 6-ton units using Freon for concealed or suspended installation, all of which performed the six principle functions of air conditioning.

Mueller Furnace Co., Milwaukee, introduced a series of domestic systems, and Universal Cooler brought out a 10-ton, 10-hp. compressor, designed particularly for air conditioning. Carrier put its new "Room Weathermaker" on the market.

A new line of self-contained units and residential cooling systems was announced by the Holland Furnace Co., Holland, Mich., and Kelvinator exhibited a new series of automatically-controlled year-around systems for residences.

### HAY FEVER TESTS

In May, Johns Hopkins Hospital, Baltimore, announced that hay fever victims had been placed in air-conditioned rooms for tests and that all indications of the malady had cleared up in two hours, but that respiratory irritation had started again as soon as they were exposed to the outside atmosphere. Reports from the hospital stated that asthma sufferers had been relieved temporarily when placed in air-conditioned rooms.

During the same month, York started production of new individual units and a central system for residential use. Shortly thereafter, American Blower announced four models for summer cooling using city tap water, ice, or electric refrigeration for cooling the air.

De La Vergne entered the field with a cabinet model operating on the reversed refrigeration cycle, and American Radiator put on the market its Decalorator system using the steam-ejector principle.

### CHICAGO FAIR JOBS

Officials of A Century of Progress announced in June that every model home at the exposition had been air conditioned. REFRIGERATION

(Continued on Page 30, Column 1)

## Minneapolis

Classification	Total Through 1935		1936		Total Through 1936		Water*
	Mech. Ref.	No. Hp.	Mech. Ref.	No. Hp.	Mech. Ref.	No. Hp.	
Restaurants	8	43	7	89	15	132	17
Theaters	0	0	0	0	0	0	36
Stores	19	96	8	68	27	164	13
Offices	15	140	13	52	28	192	9
Beauty Parlors	1	2	0	0	1	2	1
Funeral Homes	1	6	0	0	1	6	22
Hotels	0	0	1	20	1	20	4
Factories	1	10	4	9	5	19	0
Churches	0	0	0	0	0	0	2
Public Buildings	1	19	1	28	2	47	1
Banks	0	0	0	0	0	0	2
Residences	18	38	33	72	51	110	43
Railroad Coaches	1	60	0	0	1	60	0
Hospitals	0	0	0	0	0	0	2
<b>Total</b>	<b>65</b>	<b>414</b>	<b>67</b>	<b>338</b>	<b>132</b>	<b>752</b>	<b>130</b>

\*Refers to all installations made through 1936 using deep well water or city water for cooling through sprays or counter-flow fin type coils.

## Cincinnati

Classification	Prior to 1935		During 1935		11 1/2 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Residential	39	62.25	32	47.50	70	109.75	141	210.50
Offices	43	181	35	749.25	38	582.25	116	1,512.50
Small Stores	15	266.50	9	82	21	183.75	45	532.25
Large Stores	4	1,045	4	879	1	82	9	2,006
Restaurants	17	309.50	8	406	26	366.50	51	1,082
Theaters	12	1,815	4	303	8	290	24	2,408
Miscellaneous	19	1,802	4	38.25	8	87.75	31	1,928
<b>Total</b>	<b>149</b>	<b>5,481.25</b>	<b>96</b>	<b>2,505</b>	<b>172</b>	<b>1,693</b>	<b>417</b>	<b>9,679.25</b>

## Public Service Electric & Gas Co., Newark Territory

Classification	Prior to 1935		During 1935		10 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Residences	25	64.3	17	42.1	10	20.4	52	126.8
Private Offices	30	216.1	7	11.3	9	131.8	46	359.2
Restaurants	17	250.4	7	110.6	18	372.6	42	733.6
Retail Stores	18	140.2	9	182.2	30	565.7	57	888.1
Offices	0	0	6	105.6	3	22.7	9	128.3
Banks	4	302.7	2	172.0	3	62	9	541.7
Funeral Homes	5	35.6	2	23.2	4	29	11	87.8
Beauty Parlors	0	0	1	10.2	2	6	3	16.2
Theaters	14	3,614	3	143	1	150	18	3,907
Hospitals	0	0	0	0	2	122	2	122
<b>Total</b>	<b>113</b>	<b>4,623.3</b>	<b>54</b>	<b>800.2</b>	<b>82</b>	<b>1,482.2</b>	<b>249</b>	<b>6,905.7</b>

## Kansas City, Mo. Territory

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Bakeries	3	71	0	0	0	0	3	71
Banks	1	1	2	13.5	5	127.5	8	242
Beauty Shops	3	12	2	53.75	3	32.25	8	98
Buildings	1	94	4	2,157	1	71	6	2,322
Drug Stores	3	78	2	52	2	52	7	182
General Offices	34	197.75	17	160.75	21	325.66	72	684.16
Hospitals	4	3.25	6	8.25	7	50.25	17	61.75
Hotels	8	365	3	92.5	4	240.5	15	698
Miscellaneous	1	Ice	7	93.25	9	169.25	17	262.5
Funeral Homes	6	19.5	3	33	5	106	14	158.5
Restaurants & Night Clubs	23	421	12	423	21	229.88	56	1,073.88
Sales Rooms & Shops	18	405.25	15	462.75	15	529.25	48	1,397.25
Theaters	21	1,825	1	45	0	0	22	1,870
Private Offices	22	28.25	10	39	58	61	96	96.25
Residences	95	204.5	38	123.25	96	184	229	511.75
<b>Total</b>	<b>243</b>	<b>3,725.5</b>	<b>122</b>	<b>3,728</b>	<b>228</b>	<b>2,175.54</b>	<b>593</b>	<b>9,629.04</b>

## Indianapolis and Vicinity

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Banks	0	0	1	45.25	0	0	1	45.25
Beauty Shops	0	0	1	5.25	0	0	1	5.25
Churches	0	0	1	15	1	20.50	2	35.50
Clubs	0	0	1	11.50	0	0	1	11.50
Doctors and Dentists	0	0	1	4	2	1	3	5
Hospitals	0	0	1	3.50	1	18	2	21.50
Industrial Process	1	10	0	0	0	0	1	10
Candy Manufacture	0	0	2	27	0	0	2	27
Dairy	2	435	1	5.50	0	35*	3	475.50
Miscellaneous	1	5.75	0	0	1	14	2	19.75
Laboratories	0	0	0	0	1	15.25	1	15.25
Libraries	0	0	0	0	1	15.25	1	15.25
Offices (General)	4	90	1	85	8	127.75	13	302.75
Offices (Private)	4	7.75	5	6.75	20	17.67	29	32.17
Residences	9	20.50	12	34.25	28	35.75	49	90.50
Restaurants and Bars	9	219.75	9	123.25	6	96.25	24	439.25
Stores	1	603*	5	1,053.50	4	442	10	2,098.50
Dept. Clothing	1	20	0	0	1	5.50	2	25.50
Confectionery	1	4.50	0	0	0	0	1	4.50
Fur	0	0	0	0	1	2.25	1	2.25
Food	1	3	0	0	2	16.50	3	19.50
Jewelry	0	0	0	0	1	5.75	1	5.75
Shoe	0	0	1	2.50	1	3.75	2	6.25
Studios	0	0	1	2.50	0	0	1	2.50
Theaters (Electric Refrig.)	2	550	0	60*	0	0	2	610
Theaters (Washed Air-Cooled)	8	403.25	0	0	0	10*	8	413.25
Undertakers	1	6.50	0	0	1	5.25	2	11.75
<b>Total</b>	<b>18</b>	<b>395.50</b>	<b>42</b>	<b>1,482.25</b>	<b>79</b>	<b>874.17</b>	<b>166</b>	<b>4,735.50</b>

\*Indicates addition to present system.

†Indicates addition to other sections of location.

## Rochester, N. Y.

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Industrial	11	22,159	2*	126	3*	1,257.75	13	23,542.75
Office Buildings	1	188	0	0	1*	40	1	228
Offices	4	5	4	70.5	4*	14	11	89.5
Theaters	4	1,274	0	0	0	0	4	1,274
Restaurants	5	148	3*	39.5	8	113.75	15	301.25
Hotels	1	23	2	56	0	0	3	79
Stores	3	239	4	186.25	6	156.25	13	581.5
Radio Studios	1	4	0	0	0	0	1	4
Libraries	1	265	0	0	0	0	1	265
Banks	1	11	2	26.25	1	50.75	4	88
Funeral Homes	0	0	0	0	1	3.5	1	3.



## James Offers Rating For Evaporative Condensers

(Concluded from Page 27, Column 5) shown in Table 1 on an experimental bare pipe unit illustrate this point.

"According to the test results not more than 10 g.p.m. would have been necessary to secure practically optimum performance. However, it is desirable to circulate a little excess water so as to keep the coils clean and wash all deposits down the drain pan. Observing the water flow in run 45 (Table 1) under glass, it was seen that all coils were completely wetted but there certainly was not an excess of water being circulated.

"Circulators or pumps available on the market may decide just how much water is to be recirculated. For the unit tested, the results of which are shown in Table 1, the smallest acceptable water circulator had a capacity of 17.5 g.p.m. against the head imposed by the system. Smaller circulators would not pump the required minimum of 10 g.p.m. and could not be used. The design quantity was therefore fixed at 17.5 g.p.m."

### SPRAY UNNECESSARY

It was also noticed on these tests that it was not necessary to spray water over the coils. Distributing the water through holes drilled in pipe headers gave excellent results and to a certain extent eliminated trouble from nozzle clogging. Pipe distributors also imposed a lower head on the pump than was imposed by nozzles.

The quantity of water recirculated on some conventional bare pipe units ranges around 0.75 g.p.m. per ton of refrigeration, declared Mr. James. This figure may have to be increased in the case of a shallow coil having a large cross section perpendicular to the water flow, and vice versa.

It is one-fourth to one-seventh of the quantity recirculated when using a cooling tower and as it is pumped against a low head savings in pump power as compared to a cooling tower result.

The amount of make-up water required varies with the operating conditions or condensing load imposed upon the unit. About 1.75 gal./hr./ton will usually be ample but ordinarily a little excess is supplied to carry off by overflow the deposits mentioned above. This quantity is less than 3% of the quantities usually

supplied in condensers cooled by well water or city water.

### COUNTERFLOW BEST

Opposing air and water flow, said Mr. James, will usually give the best results as far as the magnitude of  $h_c$  is concerned. But this arrangement, he further explained, is neither absolutely necessary nor always economically practical.

Relatively high values of  $h_c$  are attained in the unit of Fig. 1, by a combination of air turbulence and by a water and air flow arrangement which is a compromise between opposing and parallel flows. However, the tendency of opposing water and air flow, because of its relatively higher rubbing velocities, is to increase  $h_c$  and thus markedly increase K.

K will increase with increasing air velocity, the rate of change depending on the type of surface. For a bare pipe unit with opposing air and water flow, as shown in Fig. 1, K increases as approximately the 0.475 power of the velocity. Table 2 contains test data on an experimental bare pipe unit illustrating this trend.

### AIR CIRCULATION

Although the quantity of air circulated will be determined only after a study of fan performance and coil characteristics, it can be closely approximated in advance.

Starting with a high value for c.f.m./ton and decreasing this quantity in regular increments it will be found that the rate of decrease of logarithmic m.t.d. is fairly uniform down to the point where the wet bulb temperature rise is approximately one-half of the difference between condensing temperature and entering air wet bulb temperature. Any further decrease in quantity will penalize m.t.d. at an increasing rate and the value of such a decrease becomes doubtful.

With assumed design conditions of 110° F. condensing and 78° F. entering wet bulb temperature, the wet bulb temperature rise to satisfy the above point should not be above 16° F. With 16° F. wet bulb change through the unit, approximately 190 c.f.m. of air per ton is required.

### FAN ECONOMY

However, it must be pointed out that either higher or lower values may turn out to be economical with a particular combination of a coil and a fan. This occurs because the effect of air quantity on heat transfer and the effect of fan size and horsepower on costs will tend to modify the mean temperature difference considerations described above.

"With other conditions constant," said Mr. James, "heat transfer decreases with decreasing temperature level. A study of Fig. 1 and the psychrometric chart shows why this is so.

"A change of condensing temperature or temperature level has a pronounced effect on the coefficient  $h_c$ , since it directly affects the vapor pressure difference between the wet bulb air temperature and the temperature of the water on the pipe. This vapor pressure difference is an important factor in determining the magnitude of  $h_c$ , which might more correctly be called a coefficient of vapor diffusion.

### COMPARING UNITS

"Suppose that the following two sets of conditions existed in two identical units.

"1. 110° F. condensing—85° F. average wet bulb.

"2. 90° F. condensing—65° F. average wet bulb.

"When all other variables such as air velocity, water quantity, etc., are the same, unit 1 will have the higher heat transfer value.

"In both cases the mean temperature difference is the same but analysis shows that in Unit 1 there exists a greater vapor pressure difference, water to air, than exists in Unit 2. Assuming that surface water temperature is 10° F. below refriger-

ant temperature in both cases the unit conditions would be written as follows:

"1. Surface water temp.—100° F. with 85° F. average wet bulb.

"2. Surface water temp.—80° F. with 65° F. average wet bulb.

"Unit 1 would have a vapor pressure difference of 1.916—1.201=0.715 in. of mercury, while Unit 2 would have a vapor pressure difference of 1.022—0.616=0.406 in. of mercury.

"With the actual driving force being vapor pressure difference, Unit 1 would obviously have a faster rate of evaporation of water into the air and would therefore show the higher value for the film coefficient."

Test data are given in Table 3 to show the effect of condensing temperature on the heat transfer.

### SURFACE REQUIRED

The square feet of surface required per ton will depend upon design characteristics and whether fin surface or bare pipe is considered, declared Mr. James.

Fig. 1 (bare pipe) shows that more heat can be pushed through a sq. ft. of internal surface than through a sq. ft. of external surface per degree F. It is a good plan in the design of a new unit to consider first a coil having balanced internal and external thermal resistances.

"It would be impractical to increase air and water quantities to a point where balanced resistances would result in a bare pipe unit," said the speaker. "The addition of external fin surface would accomplish an identical result since the square feet of external surface per square foot of internal surface would be increased."

Consider Formula 1 again. For bare pipe this can be written with average values as follows:

$$(2) K = \frac{1}{\frac{1.275}{1 \times 225} + \frac{1}{1 \times 70}} = 50.0$$

The temperature gradient through the bare pipe wall is shown by Fig. 1. The external and internal resistances are seen to be unbalanced in the proportion indicated by equation (2). In this case it happens that approximately two and one-half times more heat per °F. can pass through the internal resistance than can pass through the external resistance.

Assuming a fin surface having 4 sq. ft. of external surface per sq. ft. of internal surface the formula could be written with the following average values:

## Sample Rating Curve

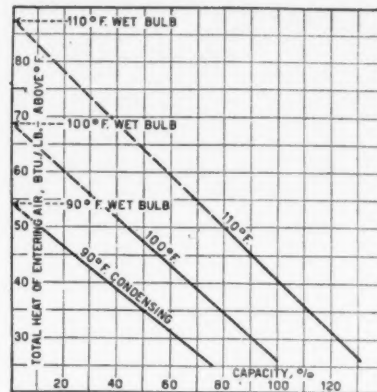


Fig. 2. For condensing water economizer—total heat refers to scale above zero F.

$$(3) K = \frac{1}{\frac{1}{4} + \frac{1}{1 \times 240} + \frac{1}{0.0167 + 0.0171}} = 29.6$$

In the above equation  $h_c$  has been increased to 240 because of a faster condensing rate per square foot of internal surface than with bare pipe. The fin efficiency has been assumed as 0.9, which means that there is some temperature change from the base to the top of the fin.

Assuming a fin surface having 16 sq. ft. of external surface per sq. ft. of internal surface the formula could be written with the following average values:

$$(4) K = \frac{1}{\frac{1}{16} + \frac{1}{1 \times 260} + \frac{1}{0.0615 + 0.0208}} = 12.15$$

In the above equation,  $h_c$  has been again increased but the fin efficiency has been assumed lower than in formula (3) because of probable wider fins.

Assumption of a fin efficiency without writing specifications around the fin is obviously open to question, Mr. James noted. However, average values are aimed for and test results have indicated that the external resistance of certain fin coils averages 0.02, which is very close to the value indicated in equation (4) above.

The external coefficient,  $h_c$ , has successively decreased with increasing external to internal surface ratio. This occurs because the greater the above ratio the lower the surface water temperature and vapor pressure difference for a given set of operating conditions. This becomes

evident upon examination of the temperature gradients. It has been pointed out above that as temperature level decreases, the external coefficient also decreases.

"The K values listed above," said Mr. James, "show that approximately four times the surface is required per ton using the fin surface of equation (4) as compared to the bare pipe surface of equation (2) under a given set of operating conditions.

"While equation (3) indicates that a fin surface with an  $\frac{a_2}{a_1}$  ratio of 4

would give approximately balanced thermal resistances and is theoretically the best proportioned surface, it does not necessarily follow that it is the most economical to use. The relative costs of specific surfaces may vary considerably in various parts of the country, and, in addition, a designer must give careful study to such factors as weight, size, method of water distribution and moisture elimination, fan horsepower, and ease of cleaning."

It has been indicated in the discussion, by the use of wet bulb m.t.d. and wet bulb K, that the capacity of a given unit in B.t.u./hr. is a function of entering wet bulb and condensing temperatures. Such a relation plots as curved lines on coordinate paper.

A refinement in rating is suggested by Fig. 2, another type of rating curve. As the wet bulb temperature has a curved line relation with total heat, plotting capacity versus total heat of the entering air straightens out the curved line relationship.

Numerous tests have indicated that at any fixed condensing temperature a straight line can be drawn through the test points when the total heat of the air is plotted against capacity. This straight line will intersect the zero capacity ordinate at a point where the entering air total heat corresponds to a wet bulb air temperature equal to condensing temperature. At this point there is no mean temperature difference available for the transfer of heat.

Wet bulb depression has been found to have little influence on performance, Mr. James explained.

The use of wet bulb m.t.d. and wet bulb K should aid materially in the solution of problems involved in the design of this type of unit. Once a unit has been designed, only a few test points are necessary to rate it in B.t.u./hr. according to the straight line law illustrated by Fig. 2, the speaker concluded.

## NEW ZENITH REFRIGERANT FILTER

Two years of successful operation in the better known commercial refrigerator units has proved the value and efficiency of Zenith Filters.

These units are now available to the Jobbing Trade. No other filter compares with a Zenith.

### CHECK THESE FEATURES

Patented Element. Full Line of Sizes. Quickly Cleaned. Easily Installed. Ample Capacity. Positive Protection. Leak-proof. Corrosion Proof.

For use with Sulphur Dioxide, Freon or Methyl Chloride.

**ZENITH CARBURETOR CO.**  
Subsidiary  
**BENDIX AVIATION CORP.**  
Detroit, Michigan

## MANHATTAN

**V BELTS**



Run smoothly... without noise... and last longer; repeated tests prove this. The highly satisfactory service and life of these belts is due to the exclusive Manhattan construction: the endless Whipcord is completely floated in rubber, welded securely into a strong tension member which is placed in the neutral axis area. Above this an extensible section and below, a compression section. Result: internal heat reduced to a minimum.

**THE MANHATTAN RUBBER MFG. DIV.**

Of Raybestos-Manhattan, Inc.  
45 Townsend St. Passaic, N. J.

## PERFORMANCE JUSTIFIES the SWING to CONTROLS

They Take the Leaks Out of Profits

The tremendous swing to Controls is not an accident... it didn't "just happen". On the contrary, the increasing and enthusiastic preference for Expansion Valves is a natural conclusion justified by the amazing record of performance shown by the thousands of these controls now in daily service.

Thermostatic Expansion Valves have successfully licked the common mistakes which are responsible for the great majority of service troubles. Mechanical failure to function under varying conditions is a thing of the past wherever Expansion Valves are in use.

Remember, an Thermostatic Expansion Valve may be installed in any position, or in any temperature, even though higher or lower than the bulb.

PROGRESSIVE JOBBERS EVERYWHERE  
STOCK CONTROLS

# EXPANSION VALVES

**AUTOMATIC PRODUCTS COMPANY** 2450 N. 32nd Street **MILWAUKEE, WISCONSIN**



## More Air-Conditioning History To Follow Next Week

Compressed as it is into the comparatively short space of the past decade, the history of the air-conditioning industry's development presents a fast-moving panorama of flux and rapid development, both of the product and the market.

The following history of air conditioning from its inception, taken from the files of *ELECTRIC REFRIGERATION NEWS* and later *AIR CONDITIONING AND REFRIGERATION NEWS*, the first part of which has been presented in this and foregoing pages, presents

development of the product, formation of new companies, introduction of new models, and adaptations of air-conditioning equipment to new and varied uses from early in the present century until the end of 1936.

To facilitate logical presentation, the record has been broken up into two parts: the first, or "infant" period of the industry, covering the years 1911-1933, published in this issue; and the period of intensive development, covering the past three years, will be published in the Jan. 13 issue.

## Late 1933 Marked by Utility Group Urging Power Companies to Promote Conditioning

(Concluded from Page 28, Column 3)

NEWS, in an editorial, viewed this display as the biggest single boost to date given to air conditioning to drive the idea home in the public mind by showing air conditioning to be an integral part of the modern American home.

A June meeting of the Edison Electric Institute voted air conditioning the approaching Number One load-builder for public utilities, and urged the country's central stations to push the new industry aggressively.

New York, Detroit, and Chicago outlets reported increased sales during July. The Campbell Metal Window Corp. entered the field with a six-function line which eliminated outside noises through a Maxim silencer labyrinth in the cabinet.

### UNITS DEFINED

During July, a Chicago meeting of 40 prominent manufacturers agreed on a set of functional definitions for the three accepted types of air-conditioning systems: summer, winter, and the complete six-function system.

The conclave decided that systems advertised as "complete" must provide simultaneous control of temperature, humidification, air motion, and cleaning the air, all on a year-round basis of both heating and cooling.

### WINTER SYSTEMS

Winter systems, the manufacturers declared, must provide simultaneous control of temperature, humidity, air motion, and air purification during the winter months, and summer systems must perform the same functions during the summer months.

The following companies entered the field with new models during July: Kauffman Air Conditioning Corp., St. Louis; Strang Air Conditioning Corp., Kansas City; Grinnell

Co., Providence, R. I.; Continental Air Conditioning Co., New York; Rudy Furnace Co., Dowagiac, Mich.; Lakeside Co., Hermansville, Mich.

During the month, the NEWS, in a nation-wide survey, listed 43 manufacturers of summer-and-winter systems, 21 making winter systems, and 17 manufacturing summer systems alone.

Westinghouse announced a new line of eight models the same month, followed by Servel's announcement of a new line exerting from 1 to 5 tons refrigerating effect.

### UTILITY PROMOTION

Edison Electric Institute in October issued another report on the field, urging public utilities to create air-conditioning promotional departments, to cooperate with local distributing outlets by having central station engineers act as consultants, establish demonstration rooms, and organize dealer bureaus to push air conditioning sales.

REFRIGERATION NEWS, in November, commented editorially on the "army of the inexperienced" entering the field, and emphasized the need for guidance by the older manufacturers as numerous "fly-by-night" companies rushed into manufacturing to participate in profits. The industry, said the NEWS, has always been bothered by opportunists who climbed on the bandwagon whether their products would do the job or not.

At this time, the United States Patent Office announced that air conditioning patents were pouring in at the rate of 300 per day. A special department was set up to handle the influx.

### HUMIDITY CONTROL

In December, the Minneapolis-Honeywell Regulator Co. announced a complete series of relative humidity controls, and Servel brought out a complete line of domestic and industrial models.

As the year closed, it was announced that American railroads were spending from \$4,000 to \$8,000 per car in air conditioning trains.

A survey conducted by the NEWS during December showed that small units of up to 10 tons' capacity had made the greatest sales strides during 1933. Small stores, restaurants, private offices, small theaters, and residences proved the best buyers.

The survey showed that half as many installations had been made during 1933 as had been made during all the years previous to 1933, and that the connected horsepower total during the year was one-eighth of the total made previously.

The average connected horsepower load before 1933 was 80 tons; during 1933 it was 20 tons. Predominance of low horsepower installations in 1933 was attributed by the NEWS to the dearth of large construction in the "rock bottom" construction year of the depression.

## Air Conditioning Fills Health Need for Air Purification

NEW YORK CITY—You would not think of going into a restaurant and ordering a pound of dust for lunch—yet that, in effect, is what every city resident does at least once during the year.

According to a study made public by the Temperature Research Foundation of Kelvinator Corp., there is precipitated in the lungs of the average man during the course of a single year, more than 1.2 pounds of various dusts.

Citing the importance of air conditioning, the report continues: "This direct harm to health is not the only effect of dust in unconditioned atmospheres. It dirties homes, clothes, offices and stores, and this calls for additional exertion to maintain at least the minimum standard of cleanliness consistent with the principles of modern hygiene."

The average dust fall in a large city is approximately 230 tons per square mile per month according to the study. An adult takes into his lungs more than 500 cu. ft. of air each day. This air, in passing through the respiratory organs which are constructed as a perfect filter, precipitates practically all of its dust with the incidental germs.

Purifying the air is an important function of air conditioning, the report points out. Among the harmful components of city dust eliminated in air conditioned homes and offices, it has been found, are carbon in many forms and compounds, iron oxides, sulphur trioxide, chlorine compounds, and tar.

## Denver Apartment Installs Conditioning

DENVER—The first application of air conditioning to hotel apartments in this section of the country is nearing completion at the Brown Palace hotel here, where between 60 and 70 new apartments are under construction in space on the ninth floor occupied until recently by steam pipes alone.

"We expect the air-conditioning equipment not only to make the apartments easier to rent, but also to add about 25% to their rental value," says F. M. Hoart, manager of the hotel. "Later, we intend to condition the rest of the hotel."

York equipment is being used in making the installation. Walter H. Simon of Denver is the architect.

The system is designed to circulate 21,400 c.f.m. of outside fresh air to the conditioned areas for summer cooling. Automatic concealed radiation has been installed for winter heating, but the summer conditioning system will circulate approximately 10,000 c.f.m. of fresh air during the winter for ventilating purposes.

Operation of the system, which includes a dehumidifier or washer containing direct expansion coils, using Freon-12 as the refrigerant, will be completely automatic, each room having its own thermostatic control and automatic damper to properly proportion the amount of air admitted to the room.

Operation of the Freon-12 condensing unit is also automatic, the equipment going into operation when outside air conditions become warm enough to demand it. A York "economizer," applying the forced draft cooling tower principle to the condensing process, is also being used.

Conditioned spaces will be maintained at an average temperature of 80° F. dry bulb, at a relative humidity not exceeding 50%, when the outside dry bulb temperature is 95° F. and the outside entering wet bulb temperature is 63° F.

## Air Conditioning Firm Established in Topeka

TOPEKA, Kan.—The Topeka Air-Conditioning Co. has recently established offices at 209 Ninth St. here.

The new company is equipped to install building insulation and air-conditioning and heating equipment. It will also render engineering service.

## Surveys of Conditioning Installations in Smaller Cities & Other Areas to be Published in Jan. 13 Issue of News

In this issue, *AIR CONDITIONING AND REFRIGERATION NEWS* has presented the first part of what it believes to be the most extensive survey ever made of air-conditioning installations, classified by type of business purchasing the equipment.

This week's figures have covered most of the larger cities. In the Jan. 13 issue, the NEWS will publish figures for smaller cities, and for wider areas served by a single utility.

Next week's reports will cover the following territories: Springfield, Mass., territory; Spokane, Wash.; St. Paul, Minn.; Omaha, Nebr.; Sioux City, Iowa; Fresno, Calif., area; Manchester, N. H.; Syracuse, N. Y.; Hagerstown, Md.; St. Joseph, Mo.; Beaumont, Texas, territory; San Antonio, Texas; El Paso, Texas; Tulsa, Okla.; Oklahoma Gas & Electric Co. territory; Birmingham, Ala.; Richmond, Va.; Jackson, Mich.; Jacksonville, Fla.; Atlanta, Ga., and vicinity; Ohio Edison Co. (Akron Division); Chattanooga-Nashville territory of Tennessee Electric Power Co.; Mississippi Power & Light Co.; and Hartford, Conn.

## - AIR CONDITIONING SURVEYS -

### Louisville

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Theaters	7	626	2	45	0	0	9	671
Industrial	4	306.5	1	20	8	111.5	13	438
Stores	5	123.5	16	352.25	16	233.73	37	709.48
Restaurants	5	86	2	38	0	0	7	124
Offices	7	14	0	0	11	45.1	18	59.1
Residences	11	33	4	1	1	3.33	16	37.33
Photo Engraving	1	15	0	0	0	0	1	15
Hotels	1	5.5	0	0	2	13	3	18.5
Hotel Restaurants	2	31	3	46.5	0	0	5	77.5
Tap Rooms	1	5	0	0	0	0	1	5
Radio Studios	1	6	0	0	0	0	1	6
Miscellaneous	5	79.5	7	210.5	2	123.5	14	413.5
Total	50	1,331	35	713.25	40	530.16	125	2,574.41

### Houston, Texas

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Banks	3	445	0	0	0	0	3	445
Building & Loan	1	13	0	0	0	0	1	13
Barber Shops	1	15.5	1	6.5	2	22	4	44
Beauty Shops	1	16	0	0	1	4	2	20
Mortuaries	1	11.5	0	0	0	0	1	11.5
Offices	17	130.5	3	65.6	19	172.4	39	368.5
Office Buildings	1	715	0	0	0	0	1	715
Radio Studios	2	12	0	0	0	0	2	12
Residences	7	49.5	4	16.05	20	74.5	31	140.05
Cafeterias	4	483	0	0	0	0	4	483
Restaurants	4	107	2	38.5	9	127.5	15	273
Night Clubs	1	64	0	0	0	0	1	64
Clothing Stores	6	117.5	5	144.3	7	357	18	618.8
Shoe Stores	3	26	2	14.9	3	28	8	68.9
25 Cent & \$1.00 Stores	1	153	0	0	1	200	2	353
Jewelry Stores	1	14	0	0	1	17	2	31
Miscellaneous Stores	2	22	0	0	1	49	3	71
Theaters	7	1,689	2	283.5	2	150	11	2,122.5
Electric Co. Sales Offices	1	103	0	0	0	0	1	103
Private Offices	0	0	2	8.25	0	0	2	8.25
Hotels	0	0	2	325	1	220	3	545
Department Stores	0	0	1	405	0	0	1	405
Clubs	0	0	1	19.5	0	0	1	19.5
Hospitals	0	0	1	16	2	21.5	3	39.5
Buildings	0	0	1	943	0	0	1	943
Churches	0	0	0	0	1	21	1	21
Grocery Stores	0	0	0	0	3	124.5	3	124.5
Drug Stores	0	0	0	0	5	61.5	5	61.5
Total	64	4,166.5	27*	2,288.1*	78	1,649.9	169	8,124.5

\*Information submitted covers only first eight months of 1935.

### Brooklyn Edison Co., Inc.

Classification	Prior to 1935		During 1935		11 Mos., 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Bakery	1	1.75	1	3.25	0	0	2	5
Bank	3	628.15	1	25.5	2	51	6	704.65
Beauty Parlor	0	0	1	3.2	2	25*	3	*28.2
Book Shop	0	0	0	0	1	*	1	*
Department Store	2	300	2	1,672	1,100	4	3,072	
Andy Shop	0	0	0	0	2	3.4	2	3.4
Dress Shop	3	61.5	5	48	5	68	13	177.5
Cosmetic Shop	0	0	0	0	1	*	1	*
Drug Store	0	0	1	6.4	0	0	1	6.4
Electrical Store	1	6.55	0	0	0	0	1	6.55
Funeral Parlor	1	9.45	2	39.75	1	110	4	159.2
Furrier	0	0	1	1.5	0	0	1	1.5
Governmental	0	0	0	0	2	280.5	2	280.5
Hospital	1	.5	0	0	0	0	1	.5
Hotel (Cocktail Lounge)	0	0	0	0	1	7.5	1	7.5
Liquor Store	1	6.5	1	3	0	0	2	9.5
Men's Furnishings	0	0	2	6.4	6	44.9*	8	*61.3
Physicians' Offices	2	1.55	6	11.7	0	0	8	13.25
General Offices	4	100.7	3	106.5	1	*	8	*207.2
Private Offices	5	5.49	7	12.57	1	1.05	13	19.11
Podiatrist	0	0	0	0	1	*	1	*
Residences	3	11	8	8.9	0	0	11	19.9
Restaurants	6	166.1	4	65.5	8	242.25	18	473.85
Shoe Stores	3	27.75	5	50	3	*	11	*77.75
Theaters	25	5,846	10	225.5	12	519.5	47	6,591
Industrial	15	534.2	5	325.05	3	10.1	23	869.35
Total	76	7,707.19	65	2,614.72	52	2,463.2	193	12,785.11

Includes stores where building owner supplies tenant. Total hp. 45. No split made for load of each store.

### Toledo, Ohio

Classification	Prior to 1935		During 1935		During 1936		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Banks	1	268	0	0	..	..	1	268
Barber Shops	0	0	1	3	..	..	1	3
Factories	2	205	3	87.5	3	120	8	412
Funeral Homes	3	16	5	40	1	8	9	64
Hotels	2	87	1	80	1	17	4	184
Offices	6	9	5	65	9	100	20	174
Residences	8	13	2	4	4	6	14	23
Restaurants	0	0	2	34	11	216	13	250
Stores	0	0	4	104	14	457	18	561
Theaters	2	870	1	60	4	277	7	1,207
Miscellaneous	1	5	2	12.5	0	0	3	18
Total	25	1,473	26	490	47	1,301	98	3,164

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Prove it at our expense



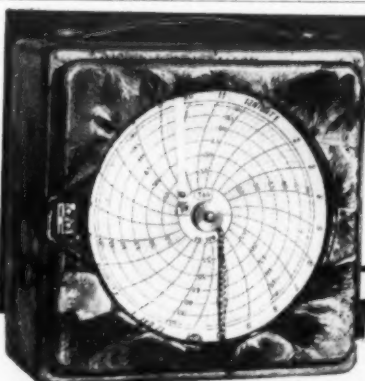
Send for free sample of Shelf-X and make the sliding cup test

Shelf-X has a smooth, flat surface upon which containers can be moved freely without tipping or spilling. Since Shelf-X has no mechanical joints it is sanitary and easy to clean. It supports small objects; yet it permits easy circulation of air.

Also used for Air-Conditioning Screening Because it has a large open area assuring good air circulation Shelf-X is as good for air-conditioning screening as it is for refrigerator shelving.

Write for free sample and complete details. Address United States Gypsum Company, Dept. 21-ACR, Steel Products Division, 300 West Adams Street, Chicago. Manufactured by:

UNITED STATES GYPSUM COMPANY  
STEEL PRODUCTS DIVISION, 300 W. ADAMS ST., CHICAGO



C. J. TAGLIABUE MFG. CO.  
Park & Nostrand Aves.,  
Brooklyn, N. Y.

## In Selling or Servicing AIR CONDITIONING INSTALLATIONS You need this TAG MINIATURE TEMPERATURE RECORDER

A record of temperature is indispensable in checking the performance of air conditioning equipment. By a permanent written line on a 4" x 4" chart, this Miniature TAG Recorder assists in the sale and service of air conditioning installations. This dependable, precise instrument is only 5 1/2" square by 4 1/4" deep and weighs less than 3 1/2 lbs. Ask for prices and Catalog No. 1136-25.



## Air Conditioning MADE EASY

This manual and textbook on air-conditioning engineering practice was written by F. O. Jordan, assistant chief engineer of Airtemp, Inc.

Mr. Jordan has been engaged in air-conditioning engineering work for a number of years, having been with Kelvinator Corp. before joining Airtemp. He is a graduate of Purdue University and was an instructor at that institution for a time. He has

written a number of treatises on air conditioning.

The following instalments of the manual, which is scheduled for publication in book form in June, 1937, have appeared in the News:

What is Air Conditioning?—Sept. 23.

Section 1, Introduction—Sept. 30.

Section 2, Definitions and Simple Thermodynamics—Sept. 30.

Section 3, Coil Performance—Oct. 7 and 14.

Section 3A, Water Cooler Performance—Oct. 14.

Section 4, Condensing Unit Performance—Oct. 21.

Section 5, Air Movement and Ventilation Requirements—Oct. 28.

Section 6, The Complete Air-Conditioning System for the Cooling Season—Nov. 4, Nov. 11 and 18 (Controls), and Nov. 25 (Indirect Expansion System).

Section 7, Heating—Dec. 2, 9, 16, 23, and 30.

## — AIR CONDITIONING ENGINEERING —

### Installation of Two-Pipe Hot Water and Central Heating Systems Is Described

#### SECTION NO. 7 Heating (Continued)

BY F. O. JORDAN

#### Two-Pipe Gravity Hot-Water System

Fig. 47 shows typical arrangements of the two-pipe gravity hot water system. Since these cuts are diagrammatic only, see Figs. 4 to 41 inclusive for methods of making various connections.

The various features mentioned in the paragraphs on "Hot Water," re-

garding prevention of air pockets, strain due to expansion, etc., must be observed in the design and installation of this system.

In the case of one-story installations, circulation of hot water may be improved by using a circulating loop, extending up ten feet or more, as shown by Fig. 46.

Either "closed" or "open" expansion tanks (See Figs. 34 and 35) may be used, although no expansion tank is

necessary if the make-up water connection to the city water mains is left open to allow for expansion of the water in the system, and if the system is provided with automatic air valves at all high points for the relief of entrained air.

It will be noted in Fig. 47 that a "direct" and a "reversed" return system is shown. The advantage of the "reversed" system is that the length of each circuit, and therefore the pressure drop, is approximately the same from the boiler, through the return piping, and back to the boiler.

For this reason, the reversed return system is easier to balance, and more likely to function properly. Although it may appear that this system requires more piping than the direct system, usually the system may be laid out so that little or no more piping is required than for the direct system.

The water circulation may be speeded up and the capacity of the system may be increased by the installation of a circulator in the system, preferably in the return main near the boiler. The circulator consists of a small motor-driven impeller in the water stream which adds its impulse to the effect of gravity circulation.

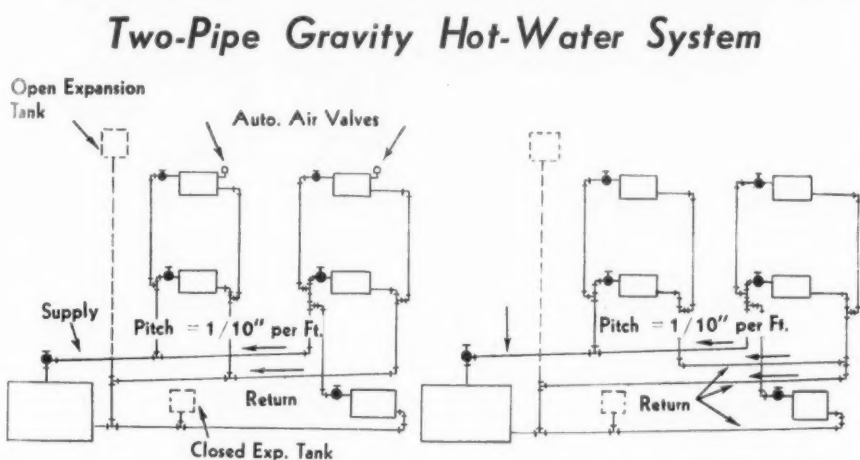


Fig. 47—Typical arrangements of the two-pipe gravity hot-water system.

#### Two-Pipe Forced Hot Water System

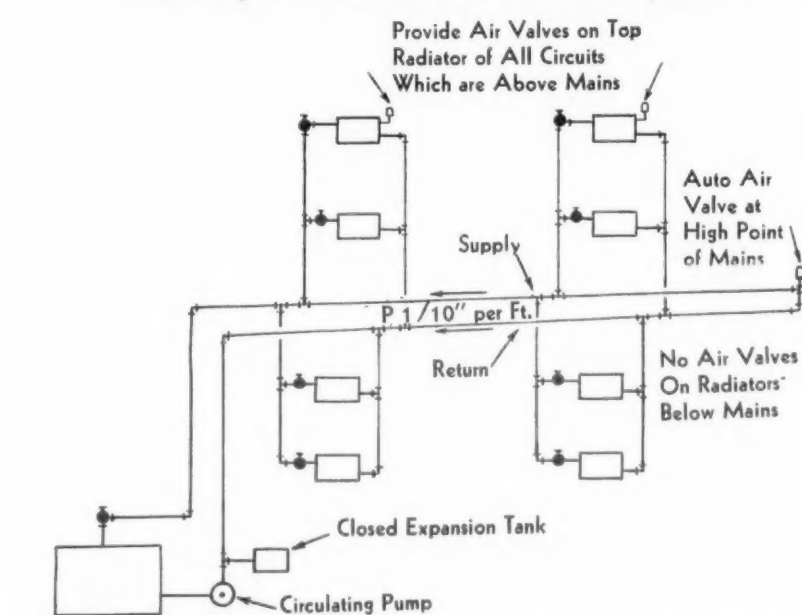


Fig. 48—Typical forced-circulation hot water heating system.

#### Central Heating System

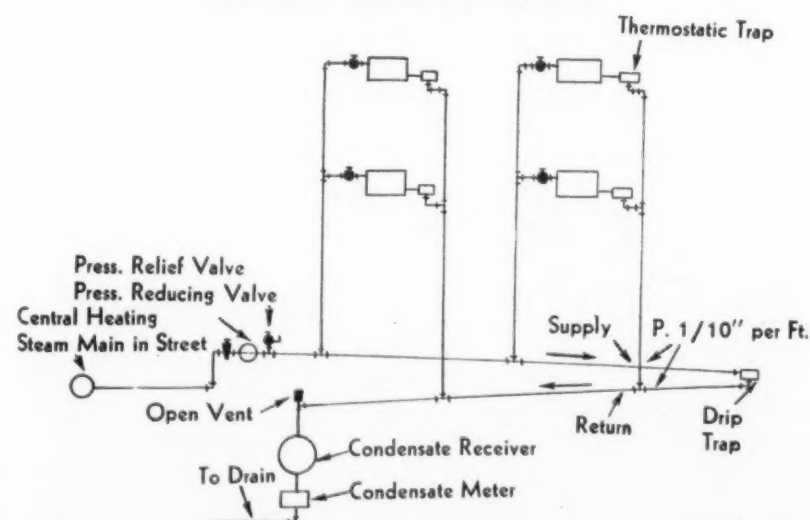


Fig. 49—Typical connections to central heating supply mains.

### Scientists Study Outdoor Air to Discover Its Bracing Qualities

NEW YORK CITY—Eleven noted medical research scientists, college professors, and air-conditioning engineers have set out to determine and analyze, if they can, the intangible quality about outdoor air on a crisp winter morning or a balmy spring afternoon that exhilarates the average individual, and fills him with zest.

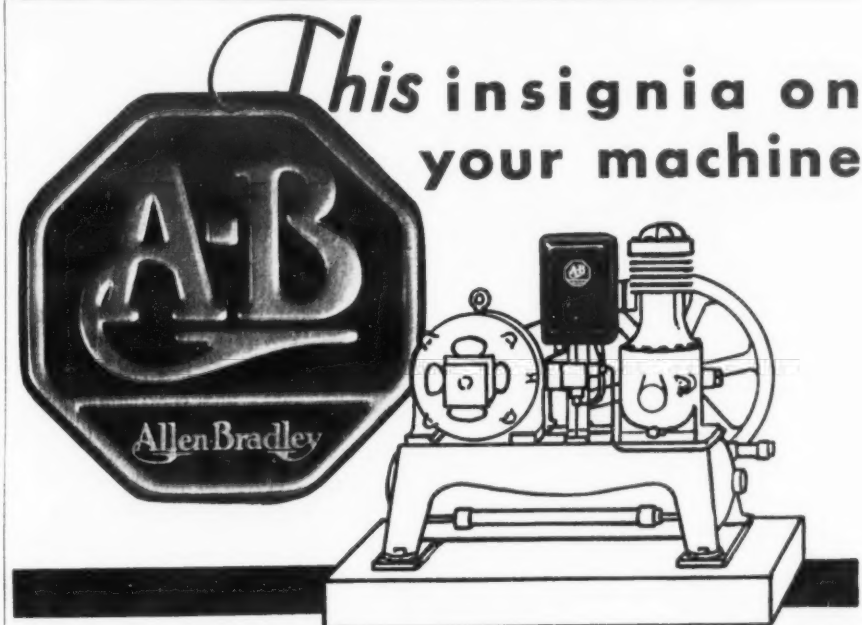
The engineers want to inject this same vitamin-like property into the conditioned air supplied to homes, theaters, stores, and auditoriums.

No one seems to know just what this rare quality of outdoor air is, but all agree that it exists. One theory, based on experiments at Harvard University in cooperation with the American Society of Heating and Ventilating Engineers, relates it to negative electrification of the air by the sun's cosmic rays.

This new research project, designed to bring indoor air as close as possible to nature's original, has been instigated by the A.S.H.V.E. committee on research.

The work will be carried out by a special committee on "The Treatment of Air With Electricity." Serving on the committee are: Prof. C. E. A. Winslow, School of Medicine, Yale University; Prof. C. R. Wait, Carnegie Institute of Terrestrial Magnetism; Prof. W. T. Wells, Harvard School of public health.

Major W. D. Fleming, physicist, Walter Reed Hospital; Prof. Vannevar Bush, Massachusetts Institute of Technology; Dr. C. A. Mills, professor of experimental medicine, University of Cincinnati; Dr. L. W. Chubb, director of research, and Dr. Robert F. James, Westinghouse Electric & Mfg. Co.; and Willis H. Carrier, chairman, Carrier Engineering Corp.



... insures  
maintenance-free  
trouble-free operation  
at all times!



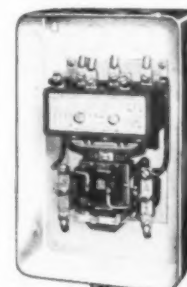
**Bulletin  
709 SP  
Single-Phase  
Starter**

An automatic across-the-line starter with a solenoid switch mechanism like that used in the Bulletin 709. Maximum rating: 3 hp, 110 volts; 5 hp, 220 volts.



**Bulletin  
700-200  
Relays**

Compact, reliable, and inexpensive remote control relays. Over 300 combinations of one to eight poles. Can be operated by thermostats or other similar pilot devices. Have double break, silver alloy contacts and solenoid mechanisms. Very rugged.



**Bulletin 709  
Solenoid Starter**

Operated by a push button, pressure switch, thermostat, or other pilot station. Note the ample wiring space, white interiors, front-panel wiring, and numerous knock-outs. All these features make installation extremely easy. Maximum rating: 30 hp, 220 volts; 50 hp, 440-550 volts.

**ALLEN-BRADLEY**  
SOLENOID MOTOR CONTROL

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Any required thickness, hard or soft. Hundreds of dies available. Write for samples and prices.  
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EXTRA DRY  
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LIQUID SULPHUR DIOXIDE  
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VIRGINIA METHYL CHLORIDE



### Long, Hund & Collins Added to Service Staff

PORTSMOUTH, Ohio—E. L. Long, Joe Hund, and S. D. Collins have been added to the staff of Mechanical Refrigeration Service Co., here, according to Service Manager E. L. Minch.

Mr. Long, formerly of Frigidaire Corp.'s engineering department, has complete charge of all commercial and air-conditioning installations, while Mr. Hund, previously connected with Frigidaire's Cincinnati factory branch, is in charge of domestic service. Mr. Collins, of Montgomery, Ala., is in charge of the shop, and supervises all rebuilding operations.

Mechanical Refrigeration Service has maintained an authorized Frigidaire

aire-service department since August, 1936. Organized in November, 1929, it has been handling service for practically all major refrigeration companies within a 100-mile radius of Portsmouth.

Manager Minch has been handling all out-of-the-city service calls.

### Debes Opens West Side Cleveland Store

CLEVELAND—Debes & Co., jobber of refrigeration parts and supplies with headquarters at 1249 East 105th St. here, is opening a new west side store at 2529 West Detroit Ave. Tom Duffner will be in charge of the new store.

### Tagliabue Issues Testing Instrument Catalog

BROOKLYN—C. J. Tagliabue Mfg. Co. has recently issued a new oil testing instrument catalog, No. 699D, listing and giving technical information on all types of testing equipment, including thermometers, hydrometers, calorimeters, viscosimeters, flash and fire test apparatus, and distillation apparatus.

The catalog also contains a revised manual for inspectors of petroleum, as well as a complete set of charts for determining viscosity-index, comparing viscosities at various temperatures, blending and determining gravity corrections.

Copies may be had by writing.

## COMMERCIAL REFRIGERATION SERVICE

### Kelvinator Horizontal Cooling Unit

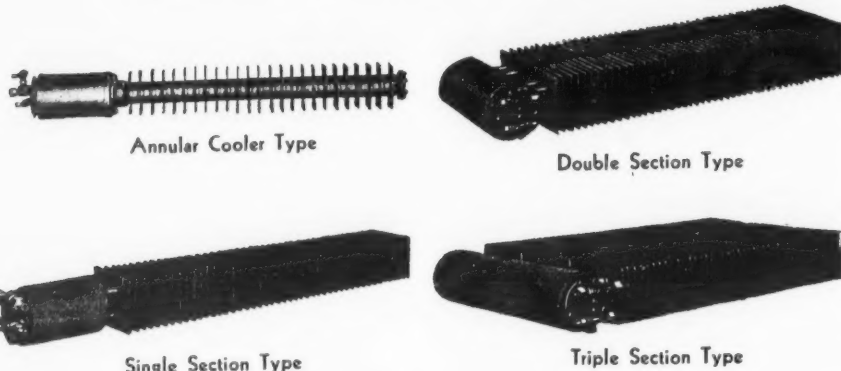


Fig. 99—Horizontal, low-side float valve cooling units. Model data below:

Model	Part No.	Type	Sulphur Dioxide Charge	Oil Charge	Overall Dimensions		
					Width Inches	Depth Inches	Height Inches
X5-10	4949	Single	5 lb. 4 oz.	12 oz.	35½	6½	5
X5-20	4872	Single	5 lb. 10 oz.	13 oz.	47½	6½	5
X5-30	4108	Single	5 lb. 14 oz.	14 oz.	57½	6½	5
X5-40	4871	Single	6 lb. 4 oz.	15 oz.	71½	6½	5
X5-50	4110	Single	7 lb.	1 lb. 2 oz.	95½	6½	5
X5-60	4841	Single	7 lb.	1 lb. 2 oz.	20½	15½	5
X5-70	4733	Double	7 lb. 6 oz.	1 lb. 4 oz.	25½	15½	5
X5-80	4734	Double	8 lb.	1 lb. 11 oz.	34½	15½	5
X5-90	4886	Double	8 lb. 6 oz.	1 lb. 12 oz.	42½	15½	5
X5-100	4885	Double	9 lb. 12 oz.	2 lb. 8 oz.	66½	15½	5
X5-130	4101	Triple	13 lb.	2 lb. 14 oz.	42½	22½	5
X5-140	4109	Triple	14 lb. 12 oz.	3 lb.	66½	22½	5
14500	Annular	5 lb. 11 oz.	3 lb. 15 oz.	53½	7	6	
14501	Annular	6 lb. 9 oz.	4 lb. 10 oz.	77½	7	6	
14502	Annular	7 lb. 7 oz.	5 lb. 5 oz.	101½	7	6	
14503	Annular	8 lb. 5 oz.	6 lb.	125½	7	6	
14504	Annular	9 lb. 3 oz.	7 lb. 14 oz.	149½	7	6	
14505	Annular	10 lb. 1 oz.	7 lb. 6 oz.	173½	7	6	
14506	Annular	8 lb. 8 oz.	3 lb. 12 oz.	53½	8½	8½	
14507	Annular	11 lb.	4 lb. 8 oz.	77½	8½	8½	
14508	Annular	13 lb.	5 lb. 4 oz.	101½	8½	8½	
14509	Annular	15 lb. 8 oz.	6 lb.	125½	8½	8½	
14510	Annular	17 lb. 8 oz.	6 lb. 12 oz.	149½	8½	8½	
14511	Annular	20 lb.	7 lb. 8 oz.	173½	8½	8½	

### Submersion-Type Cooling Unit

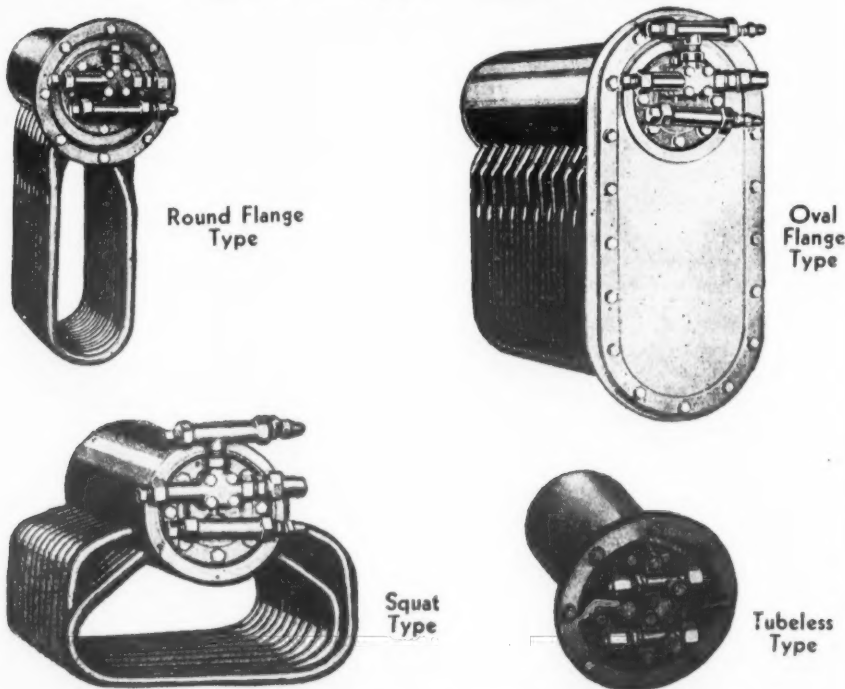


Fig. 100—Submersion-type low-side float valve cooling units. Data below:

Model	Part No.	Type	Sulphur Dioxide Charge	Oil Charge	Overall Dimensions		
					Width Inches	Depth Inches	Height Inches
E20	4264	9 tube, round	5 lb. 3 oz.	11 oz.	7½	11½	13½
	4600	12 tube, round	9 lb.	1 lb.	...	...	...
	4604	14 tube, round	8 lb. 8 oz.	1 lb.	...	...	...
	4608	18 tube, round	8 lb.	1 lb.	...	...	...
E30	4371	18 tube, short, round	5 lb. 12 oz.	14 oz.	7½	12½	12½
E40	4263	18 tube, long, round	7 lb.	14 oz.	7½	12½	17½
	4612	22 tube, round	10 lb. 2 oz.	1 lb. 4 oz.	...	...	...
E50	4267	30 tube, short, round	10 lb.	1 lb. 5 oz.	7½	18½	12½
E70	4266	30 tube, long, round	11 lb. 7 oz.	1 lb. 5 oz.	7½	18½	17½
	4616	44 tube, round	13 lb. 8 oz.	1 lb. 8 oz.	...	...	...
	4757	54 tube, round	20 lb. 8 oz.	5 lb.	...	...	...
	4602	12 tube, oval	9 lb.	1 lb.	...	...	...
	4606	14 tube, oval	8 lb. 8 oz.	1 lb.	...	...	...
	4610	18 tube, oval	8 lb.	1 lb.	...	...	...
	4614	22 tube, oval	10 lb. 2 oz.	1 lb. 4 oz.	...	...	...
	504212	24 tube, oval	10 lb. 12 oz.	1 lb. 8 oz.	...	...	...
E80	4618	44 tube, oval	16 lb. 12 oz.	1 lb. 1 oz.	13	21½	20½
E10	4200	Tubeless	3 lb. 14 oz.	11 oz.	7½	11½	7½
E11	13138	Tubeless	4 lb. 9 oz.	9 oz.	7½	12½	7½
E15	4527	Tubeless	7 lb. 4 oz.	1 lb. 5 oz.	7½	18½	7½
	4800	12 tube, squat	9 lb. 4 oz.	2 lb. 2 oz.	...	...	...
	4801	14 tube, squat	10 lb. 14 oz.	2 lb. 7 oz.	...	...	...
	4802	18 tube, squat	10 lb. 9 oz.	3 lb. 2 oz.	...	...	...
	4803	22 tube, squat	13 lb. 10 oz.	3 lb. 13 oz.	...	...	...

### Low Side Float Valve Flooded Evaporators

#### Chapter 7—Evaporators and Refrigerant Controls (Cont.)

BY K. M. NEWCUM

Several different models of Kelvinator flooded evaporators are shown in Figs. 99, 100 and 101. The data on the refrigerant and oil charge is also given.

Frigidaire was one of the first to manufacture and market commercial flooded evaporators using the lowside float.

#### BOILER AND TUBE TYPE

These original commercial evaporators were of the plain boiler and tube type similar in appearance to the 10x and 6x, shown in Fig. 112. Their first application was in the end bunkers of what was then called "freezer cases." These freezer cases were designed for use with special ice and salt tanks with horizontal flues. The ice and salt provided sufficiently low temperatures and the horizontal flues provided circulation to all parts of the case. The melting ice provided moisture to keep dehydration to a minimum.

Needless to say the flooded evaporator had a real competitive job to perform satisfactorily in these freezer

### Summary of Instalments Of Commercial Manual Already Published

Chapters 1 and 2 of the Commercial Service Manual by K. M. Newcum were omitted from the News, inasmuch as they are of basic material which has been previously covered in the paper, but will appear in the completed book scheduled to be published in April, 1937.

The following instalments have appeared to date:

Chapter 3, Cylinders, Valves, and Safety Devices for Refrigerants—Aug. 5, 12, and 19.

Chapter 4, Methods of Transferring Refrigerants to Smaller Cylinders—Aug. 19.

Chapter 5, Drying of Refrigerants—Aug. 26.

Chapter 6, Commercial Condensing Units—Body and Housing Assemblies, Sept. 2; Crankshaft, Eccentric, and Connecting Rod Assemblies, Sept. 9; Piston and Piston Valve Assemblies, Sept. 16; Discharge Valve Assemblies, Sept. 23; Suction Valves and Stuffing Box Seals, Sept. 30; no instalment published Oct. 7 and 14; Compressor Shaft Seals, Oct. 21; no instalment published Oct. 28; Compressor Shut-off Service Valves, Nov. 4; Air-Cooled Condensers, Nov. 11; Liquid Receivers, Nov. 18; Double-Tube Condensers and Water-Cooled Condenser-Receiver, Nov. 25; Water-Regulating Valves, Dec. 2, 9, and 16.

Chapter 7, Evaporators and Refrigerant Control Valves—Low-Side Float Valves and Evaporators, Dec. 23; Float Valve Calibration, Dec. 30.

cases in place of the ice and salt tank.

Preliminary tests revealed that the plain boiler and tube evaporator did not have sufficient capacity even though the evaporator completely filled the bunker.

It is considered a fact that a young and enterprising engineer in a mid-western city conceived the idea, after many sleepless nights, of soldering some pieces of galvanized iron to the tubes of the evaporator to increase the evaporator surface.

#### 'FINNED' EVAPORATOR

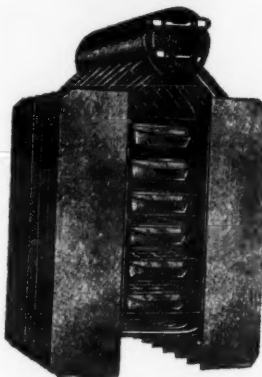
This first "finned" evaporator was crude looking but the results were most enlightening. This was the birth of the "finned" evaporator. This idea was then put into commercial practice and other finned evaporators were produced in the following years. Although these earlier models like the old Model "T" Fords are now looked upon as obsolete, they played a very important part in the development of the commercial refrigeration industry.

A typical flooded Frigidaire lowside float type evaporator is shown in Fig. 102. A complete Frigidaire float valve assembly is shown in Fig. 103. The detail of the same float valve is shown in Fig. 104.

### Vertical Units



Multiple  
Apartment  
Type



Commercial  
Unit

Fig. 101—Kelvinator vertical-type, low-side float valve cooling units.

### Cooling Coil Assembly

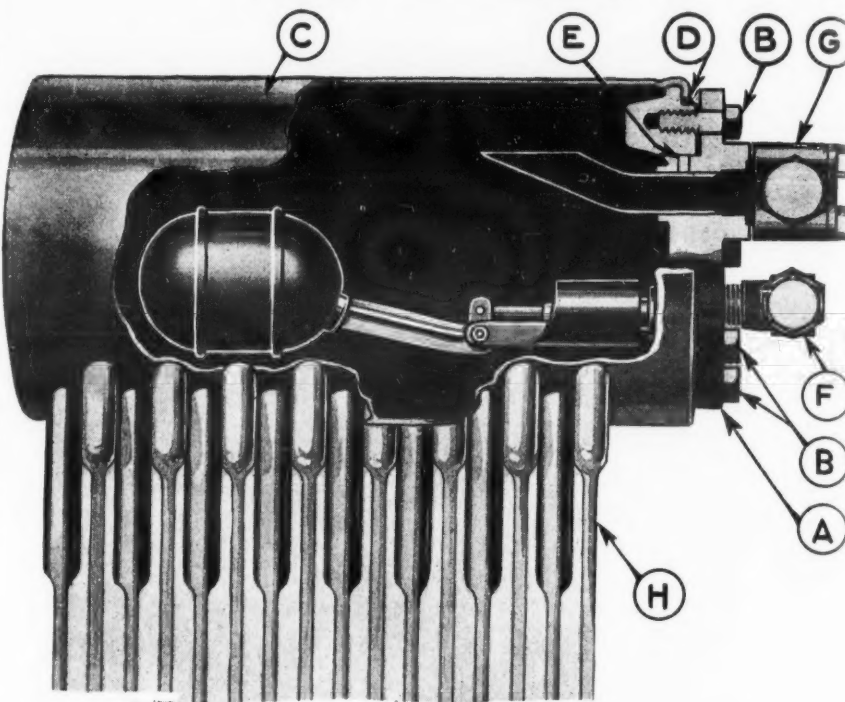


Fig. 102—Cooling coil cutaway to show various parts. "A" is the float valve assembly clamped in the boiler "C" by the use of cap screws "B." A tight seal is formed by a lead gasket at "E." The tubes at "H" contain refrigerant as well as the boiler proper. The boiler is silver soldered to the header at "D."

### Complete Float Valve

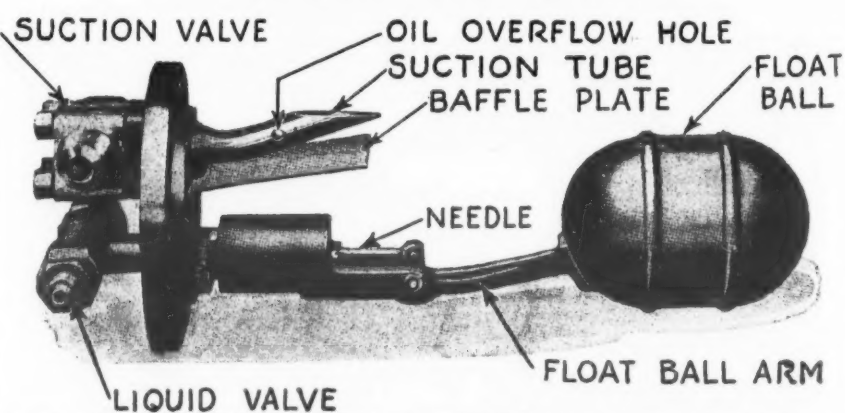


Fig. 103—A complete float valve, illustrating and naming the various parts in the construction.

### Detail of Float Valve Construction

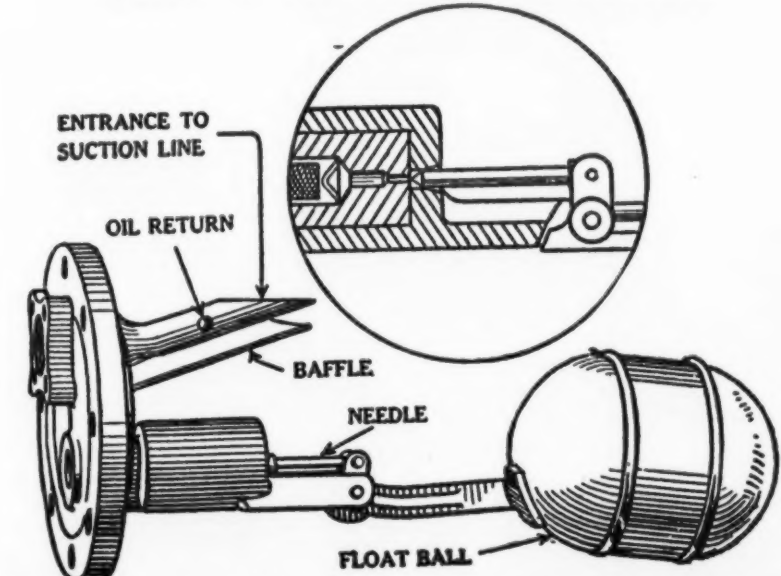


Fig. 104—Drawing showing detail of float valve construction. Insert shows how needle is constructed.



## What the Executives Were Asked

Letters on this and the following page are in answer to a letter from the editor of AIR CONDITIONING AND REFRIGERATION NEWS asking answers to the following questions:

1. What should the total dollar volume of air conditioning sales to the public be in 1937?
2. What percentage of increase over 1936 do you expect your air-conditioning business to show in 1937?
3. Which of the following divisions of air-conditioning equipment to you expect to show the greatest increase, and why: complete systems, room-type unit conditioners (complete), room coolers, winter conditioning systems?
4. Do you foresee a trend toward "packaged" units?

5. What type of salesman will be most valuable to the industry next year: refrigeration-trained specialty salesmen, air-conditioning engineers, plumbing and heating men?

6. Is there a good opportunity for the successful commercial refrigeration distributor in the air-conditioning business? Please elaborate on the future that air conditioning may hold for a specialty selling organization with a refrigeration background.

7. What steps should the air-conditioning industry take to educate its distributing organizations as to: (1) proper methods of doing business; (2) their opportunities; (3) increasing sales?

## Executives of Air-Conditioning Firms Give Views on 1937 Sales Volume Possibilities & Distributing Trends

### Gar Wood View Is That Dealer Must Handle Heating Line

Gar Wood Industries, Inc.  
7924 Riopelle St., Detroit

Editor:  
Referring to your first question, regarding the total dollar volume of air-conditioning sales to the public in 1937. We must first ascertain exactly what you mean by "air-conditioning sales." We interpret air conditioning, from our standpoint, as residence air conditioning, and in particular winter air conditioning by automatic oil fired units, where the following conditions of the air are fulfilled:

1. Filtering
  2. Circulating
  3. Heating
  4. Humidifying
  5. Blower cooling for summer
- Residence winter air-conditioning systems do not necessarily embody mechanical refrigeration means, for lowering the temperature of the air and dehumidifying it. These two latter functions (cooling and dehumidifying) being particularly for summer cooling, and closely allied to your electric refrigeration.

From statistics which come to us, compiled by reputable sources, we learn, in 1936, 150,000 residences were built. This was a considerable increase over 1935, in which period records show there were 70,000 residences built. These same sources indicate, in 1937, we can expect residential building to be increased at least 40%. On this basis, better than 200,000 residences will be built in 1937. Of these, it is safe to say half will have some modern form of winter air-conditioning and heating systems. This would mean approximately 100,000 new residences to be equipped with winter air conditioning. No doubt many of these will also have supplemental mechanical means for dehumidifying and cooling, in the summer.

To these 100,000 of course will be added a great many installations which are replacements in existing residences. No doubt it will be safe to assume not less than 150,000 installations of modern automatic residence air-conditioning jobs in 1937. This should mean a dollar volume, for these systems alone, of \$75,000,000. This will be exclusive of any mechanical refrigeration equipment for summer cooling.

Your second question asks what percentage of increase over 1936 we expect our air-conditioning business to show in 1937. Still speaking of residence air conditioning, our records show we made an increase in 1936 over 1935 of 102%. We do not know whether our increase in 1937 will be 100% over 1936, but we will strive to do at least that.

You ask us, in your third question, of the various divisions of air-conditioning equipment, which do we expect to show the greatest increase? We are not familiar with any but residence air conditioning, and we have given you above what we think are the possibilities in that division for 1937.

Your fourth question asks, do we foresee a trend toward "packaged" units? My personal belief is you will see a trend toward this, in summer cooling units. Residence air conditioning, allied with automatic heating, can never be a package.

You ask in your fifth question, what type of salesman are most valuable to the industry? You know this is an old question. Good salesmen are like gold—"they are where you find them." We do know untrained salesmen lose many orders which could be closed by veterans. We are also convinced a small seasoned group of salesmen, instead of a large organization of beginners, is much more effective. Good, trained salesmen with heating experience can check existing systems on the spot, select the right type of equipment, make verbal proposals, and possibly close a large percentage of deals then and there, on the first visit.

Industrial concerns offer excellent prospects for heating and air conditioning, and by the same token, are excellent prospects for summer cooling, since you can offer them cooling for profit. Remarks made here about salesmen of residence air conditioning would certainly apply to salesmen of refrigeration and summer cooling equipment. This is our personal opinion.

And in reply to your sixth question, we would say there is a good opportunity for the successful commercial refrigeration distributor in the air-conditioning business, selling residence automatic heating and air conditioning, either with or without summer cooling, provided the distributor will actually set up a department equipped with the proper personnel, and service, to carry through on the residence automatic heating and air conditioning.

You ask, what steps should the air-conditioning industry take to educate its distributing organizations as to proper methods of doing business, their opportunities, and increasing sales? We have found, speaking again strictly of residence automatic oil heating and air conditioning, a great deal of this is accomplished through industry organization. In our case, the Oil Burner Institute serves as a clearing house for a great deal of information, propaganda, enthusiasm, advertising, in fact every factor to help distributors to gain those things shown in the subnumerals of your question No. 7. This seventh question is a very broad one. In fact, a complete answer would cover the whole field of merchandising air-conditioning equipment, embodying advertising, selling, service, instructions for selling, instructions for servicing, factory contacts in the field, and field contacts at factory. All these being common factors in any business.

You have asked some very pointed questions, and it was not possible to answer them directly, Yes or No. Hence the lengthy reply.

I hope the foregoing is along the lines you require.

FRANK H. DEWEY, Manager.

### Young Sees New-Type Contractor Handling Pre-Fabricated Job

Young Radiator Co.  
Racine, Wis.

Editor:

This is in reply to your letter of Dec. 15.

1. You will have a better estimate of what the total dollar volume of air-conditioning sales in 1937 will be from some of the large producers, as Carrier, Frigidaire, General Electric, Westinghouse, York, etc. so we will make no comments on this.

2. We expect an increase of approximately 25% in our air-conditioning business for 1937 over 1936.

3. It is my opinion that complete systems and winter air-conditioning systems will advance very rapidly in their sale to the building public. Complete systems will be for perhaps buildings with so-called split systems, where the air conditioning will cool and condition the essential rooms, as perhaps a master bedroom and, downstairs, the living room, dining room, library and, perhaps a kitchen, although this I think will be the exception. These systems are going to be most greatly called for in home use. The winter conditioning systems are simple and, therefore, should be considered as logical to receive a large demand.

4. As you term the component a "packaged" unit; there will be a demand and the market is today possessed of many units which can be offered as a complete component, to be used either with well water or refrigeration compressor. These units will be in the greatest demand and the trade is ready to handle this.

5. The type of salesman who will be most valuable and in demand for the air-conditioning industry will be an air-conditioning engineer. Only plumbing and heating men who bring into their organization complete air-conditioning engineers, have a full knowledge of the new science and are skilled to this trade, will make the plumbing and heating men the people to serve the trade. The heating man for winter air conditioning, of course, can handle these but for strictly air-conditioning units he will have to have, in my opinion, a trained air-conditioning engineer.

6. I believe that there will be a new group of installation contractors who will develop to handle the air-conditioning installation and special engineering and application of the so-called pre-manufactured systems. There will always be a certain amount of ground and field work which has to be done which will have to be handled by the so-called local distributor. In the setups, the same company which has the most valuable trained engineers is put in the field with the local refrigerator distributor or the heating and ventilating contractor. It is my opinion that the strictly refrigerator distributor will not be as much of a factor in the sale and distribution of air-conditioning units as will be the heating and ventilating contractor. The science of insulation should not be overlooked in this development as that field will enter into this strongly as a part.

7. The air-conditioning industry will have to educate its distributing organizations through sales meetings, which will really be engineering and educational meetings where cutaway sections of units and the various developments will be plainly visible to them. They will learn from and be taught by sales manuals, much the same as the refrigeration industry has already come through, much the same as the automotive industry came through or as the radio period came through. But this is more intensive than any of these as it takes into consideration many types of buildings and only the study of the application on the ground can specify the needs and the unit for those needs.

The opportunities open to those who will put this into the field are almost limitless but it should not be borne in mind, as many young college men feel, that they can just jump in and learn air conditioning in one or two years. This field is growing as fast as the automotive industries field and the men will have to grow with the industry. Increase of sales will be a factor to bring these men into the field. The field is today without any absorption period on the horizon, which is contrary to the automotive industry where we have more production facilities than we have purchasing power.

The air-conditioning industry is good for the next 10 years without cessation.

This outline gives our cursory opinions as we sit in the middle of these operations and trust they will be of interest to you and I shall be glad to have any contradictory opinion or data that you may care to submit to either sustain or refute these statements as we are ourselves very much interested in this field, being manufacturers of components which become a part of and accessory to this equipment.

F. M. YOUNG,  
President.

### Howe Believes Experience Will Be All Important

Howe Ice Machine Co.  
2825 Montrose Ave., Chicago

Editor:

The writer is very happy to be able to submit his views in connection with the air-conditioning industry and its progress for the year 1937.

This industry will make rapid strides in the new year and the writer feels that the greatest gain will be among the smaller retail stores, with installations ranging in sizes from 5 to 20 tons refrigeration capacity. Practically all of these installations will be summer cooling only.

The buyer is still at the mercy of

(Continued on Page 34, Column 3)

## BUYER'S GUIDE

SPECIAL RATES APPLY TO THESE COLUMNS ONLY  
WRITE ADVERTISING DEPT. FOR FULL INFORMATION

### The News is Out—

The Name of

PEERLESS ICE MACHINE COMPANY

HAS BEEN CHANGED TO

**PEERLESS of AMERICA, Inc.**

Same Company

Same Management

Same Policies, Quality, and Service

The name of the Peerless Ice Machine Company has been changed to PEERLESS of AMERICA, Inc. From the establishment of the Company in 1912, ice machines were produced continuously until 1930. Since that time the entire facilities of the Company have been devoted to low-side equipment, and the ice machine part of the name has been particularly inappropriate.

The "good-will" of twenty-five years' operation under the original Peerless name was an important factor in any change to be undertaken. All of the products of the Peerless Ice Machine Company of the last seven years have been known as "PEERLESS", and this essential part of the old name is retained in the new.

It was important that the new name be broad enough to cover the manufacturing of heating as well as cooling coils.

1937, our Silver Anniversary, will see the opening of Peerless factories in five other countries of the world, and it was necessary to differentiate between these various manufacturing units.

With manufacturing plants in New York, Chicago, and Los Angeles, it is truly a "PEERLESS of AMERICA".

THERE IS NO CHANGE OF ANY KIND IN THE MANAGEMENT OR OWNERSHIP OF THE COMPANY.

*W. K. Kretzer*

**PEERLESS of AMERICA, Inc.**

THREE FACTORIES

NEW YORK  
43-20 34th Street  
Long Island City

CHICAGO  
515 West 35th Street

PACIFIC COAST  
3000 S. Main Street  
Los Angeles

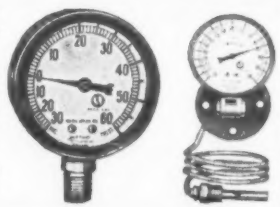
CABLE ADDRESS—PEERCOILS, DETROIT

## Refrigeration Instruments by Marsh

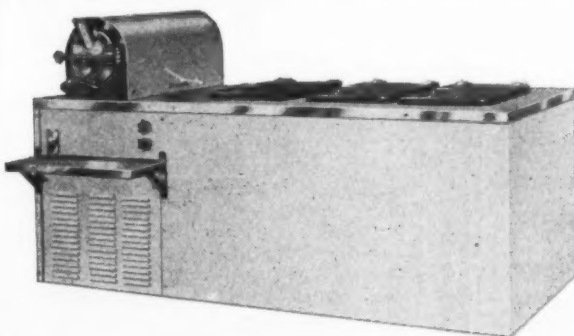
MARSH ZERO ADJUSTMENT (patent pending) assures perfect accuracy at every reading of the instrument.

Any instrument fitted with this construction can be calibrated on the job by the service man, in the plant, laboratory or instrument department within a very few minutes without the necessity of dissecting the instrument or gaining access to the interior mechanism.

Manufactured in front zero adjustment as illustrated for stationary service or back zero adjustment for portable service.



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## QUANTITY PRODUCTION

made this Super-Cold Freezer the most efficient and lowest priced in America. Undersell nearest competition \$200.00. Shipped with or without condensing unit. Thousands of interested prospects.

For Franchise write

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## DISTRIBUTORS and SALES AGENTS... **WANTED** for KOCH COMMERCIAL REFRIGERATOR CABINETS

Some very good territories still available

Complete Market Equipment by **KOCH**

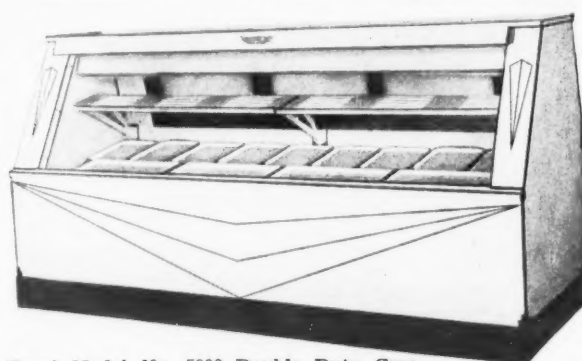
KOCH Display Cases Have 4-in. Corkboard Insulation, Triple Plate Glass, and Are Porcelain Clad

Write for full information, stating qualifications

**KOCH REFRIGERATORS**

North Kansas City, Mo.

## FOGEL OFFERS A COMPLETE LINE To Commercial Refrigeration Distributors INCREASE YOUR CASE AND COOLER PROFITS FOR 1937



Fogel Model No. 5000 Double Duty Case  
Fogel Franchise is Valuable  
Write For Details Today

**Fogel Refrigerator Company**  
Philadelphia, Pa.

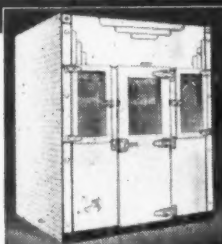
Manufacturers of Complete Market Equipment Since 1899

Factory Help Enables You to Become Leaders in Your Territory



Walk-In Cooler

## DISTRIBUTORS WANTED



Percival equipment meets every requirement of the modern food store.

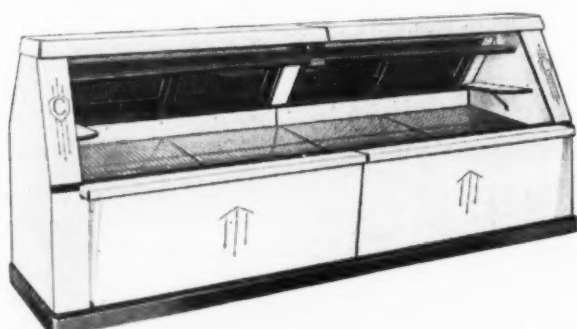
For mechanical refrigeration only

Percival's complete line will increase your sales of electrical refrigeration equipment and offer added earnings. Desirable territories still available. Write for complete information.

1886-1937  
51 years of service to meat markets

**C.L. PERCIVAL CO.**  
DES MOINES, IOWA

There is more eye-appeal, beauty and salient selling features in a Campbell Streamline Display Case than in any competitive case on the market.



If you are interested in an exclusive, profitable dealer's franchise, write,

**CAMPBELL REFRIGERATOR CO.**

748 W. Virginia Street  
MILWAUKEE, WISCONSIN

## Additional Views of Executives on Possibilities of Development in Air Conditioning During 1937

(Concluded from Page 33, Column 3)  
the incompetent, inexperienced distributor, or salesman, with the result that many unsatisfactory installations will be made. Air conditioning involves more unknown quantities than any other phase of engineering, so that the manufacturer must be extremely careful to merchandise his equipment through experienced distributors.

Based upon my 25 years of refrigeration experience, contacts, and observation in this industry, I feel that the most successful outlet will be through distributors of commercial refrigerating equipment, who have already done a good job in their individual territories.

It is the responsibility of the manufacturer to control merchandising of his own equipment in order to protect the reputation of both his company and his merchandise. Every job must be properly engineered to avoid a great deal of grief and if we keep this one thought in mind, definite progress will be made in air conditioning.

H. B. HOWE,  
President.

### Whitman Sees Sales Value Leaping to Five Billion Dollars

National Fan & Blower Corp.  
543 Washington Blvd., Chicago

Editor:

In answer to your letter of the 15th, I will attempt to answer each of the seven questions in as concise a form as possible.

1—Close to Five Billion Dollars.  
2—An increase of 150%.  
3—In complete systems—reason—increased demand amongst retailers and buildings opened for public gatherings.

4—In package units when priced within the reach of \$3,000.00 income.

5—Air-Conditioning Engineers.  
6—Undoubtedly the most practical and efficient today, selling air conditioning has a background of commercial refrigeration.

7—1—General procedure adopted by manufacturers through the association.

2—Through trade journals, advertising, and editorials.

3—Through trade, such as Jobbers, Agents, Direct Factory Representatives.

K. E. WHITMAN,  
President.

### Freeman Says Trend Is Away From Packaged Units

The Cooling & Air Conditioning Corp.  
Division of E. F. Sturtevant Co.  
Hyde Park, Boston, Mass.

Editor:

We are pleased to give you our answers to your request of Dec. 15, with respect to the cooling and air-conditioning situation, and the prospective volume.

1. We believe the public generally continues to think of air conditioning as including heating and ventilating, humidifying and cooling. On this premise we believe that the public will purchase, during the year 1937, at least \$500,000,000 worth of apparatus. We are not including in this figure the installation expense, but simply the aggregate sales of equipment.

2. We expect that our 1937 volume will be at least 20% higher than 1936. A portion of this increased volume will be due to the necessary increase in prices; in turn due to definitely higher costs.

3. Complete year-round air-conditioning systems will show the greatest increase in other than the residence field. The residence field will continue to be largely confined to winter air-conditioning systems; that is, heating and humidifying. The room-type unit conditioner inherently is not capable of giving the same satisfactory results as the complete "Central System," and the public is gradually becoming educated to this fact through use; and is in a better position to differentiate between the results of the two methods.

4. The trend is away from the packaged unit, rather than in its favor. This is due to less satisfactory performance, and resultant comfort conditions. Complete satisfaction can only be obtained when each individual problem is studied by experienced engineers, and proper design applied. No two requirements are the same. Not only due to building conditions and location of rooms to be conditioned, but also due to the varying requirements of the individual occupants.

5. Fortunately, the heating and plumbing engineers and contractors are becoming very much better acquainted with the requirements, and the application needs, and are using every reasonable effort to become thoroughly posted; and many of them

are, therefore, today in a position to sell and apply conditioning equipment with the confidence of satisfactory results.

We have found these engineers and contractors to be very much interested in the subject, and desirous of obtaining all necessary information and experience. And those who are not employing experienced engineers are open-minded and are obtaining engineering help from thoroughly posted consulting engineers, or from the engineering organization maintained by suppliers.

In answering this question we, therefore, feel that while the most valuable salesmen would be those who have a thorough training in the engineering application, as it is largely an engineering matter rather than salesmanship, nevertheless, trained refrigerating engineers, heating and plumbing engineers, and contractors are gradually but surely getting into a position to handle such work properly.

6. Year-round air conditioning in the greater part of the United States has a longer use for heating and humidifying than it has for cooling and dehumidifying. There is no better opportunity for the successful commercial refrigeration distributor than there is for the former heating contractor. A thorough application engineering knowledge of both refrigeration and heating is necessary. The specialty selling organization with a refrigeration background, is in a position to sell and engineer these products if they will become thoroughly acquainted with the air engineering requirements of the applications.

Too little attention has been paid to this air engineering, and, relatively, too much stress has been put on the refrigeration, resulting in sufficient cooling but poor air distribution, drafts, unnecessary noise, and dissatisfaction.

7. It would seem that the air-conditioning industry should be alive to the fact that none of its distributors should continue to operate with the losses that have been experienced in the past. The public must be educated to the fact that if they are to receive satisfactory comfort conditions, it means an appreciable amount of equipment and resultant cost. In turn, this means proper methods of doing business, which will give the customers satisfaction at a fair cost considering equipment involved.

This further means that every installation undertaken must be carefully and closely estimated, and provision allowed for the service until installation is well adjusted and its operation well understood by the customers' operators. There have been too many unsatisfactory jobs installed by inexperienced suppliers. Increased sales will come from satisfied customers, as in all effort of this nature.

We do not believe that the public generally appreciates the number of installations that have been made incorrectly, and which have necessitated expensive remodeling before satisfaction and acceptance could be obtained.

Manufacturers of various equipment can aid in increasing sales by advertising their products more extensively to create the desire; but sales of their product that are not properly applied are injurious not only to them but to the industry at large.

E. B. FREEMAN, President.

### Kauffman Believes Refrigeration Trained Salesmen Most Valuable

Kauffman Air Conditioning Corp.  
4485 Olive St., St. Louis  
Dec. 29, 1936.

Editor:

We have your kind favor of Dec. 15 and are very happy to cooperate with you in the matter of future prospects of the air-conditioning field, and will answer your questions in the rotation in which you ask them.

1—We believe that 1937 should be at least a 100 million dollar year for complete air-conditioning systems which, of course, means all types of air conditioning.

2—We expect at least a 50% increase in our volume for 1937.

3—We expect the greatest increase in our package type units due to the fact that there are so many small offices, residences, bedrooms, living rooms, etc., that do not care to spend the additional money for complete air cooling.

However, we feel that there will be a substantial increase in the smaller type air-cooling units for stores and retail establishments.

4—We do not foresee a trend towards package units except for the older buildings, of course.

5—We believe that refrigeration-trained specialty salesmen will be most valuable to the industry.

6—We do not feel that the commercial refrigeration distributor is the

proper man and the proper place for air conditioning. We believe that a specialty organization with trained air-conditioning engineers who, of course, must necessarily have a thorough knowledge of the heating and ventilating business in its various ramifications.

7—We think that the first step in educating the distributing organization is that they should eliminate immediately all so-called air-conditioning apparatus that is rapidly coming on the market and spoiling sales for legitimate equipment. By this we mean apparatus that is undersized and overestimated and also the various types of so-called air-conditioning equipment that the public, not being familiar with, are buying because of low and cheap prices and are being humbugged and swindled out of their money every day by a lot of sales talk that means nothing and winds up in grief and loss of hundreds of thousands of dollars yearly to the legitimate manufacturer and to the customer likewise.

We sincerely hope our views in this matter are such that they will be of some benefit to you and your paper and do not hesitate to call on us if we can be of any further assistance.

SAM KAUFFMAN, President.

### Wendt Sees Distribution Dwindle into 2 Phases

Buffalo Forge Co.  
Buffalo, N. Y.

Editor:

Yes, the air-conditioning industry is coming of age. We would guess that the manufacturers of air-conditioning equipment would do \$50,000,000 to \$60,000,000 worth of business during 1937. Speaking of our own business, we expect a 25% to 50% increase during the coming year.

We do not see much trend toward the small self-contained cooling unit including compressor. It seems to us that the so-called central system type of cooling unit is more satisfactory. Proper distribution of the cool air is so important in an air-conditioning system that it cannot be handled satisfactorily by a spot cooler.

We feel that a salesman to be successful in the air-conditioning business must also be a trained engineer. So much depends upon the proper selection of equipment that we do not think it is an easy industry for anyone to step into it and make a success.

It would seem to us as time goes on that there will be two types of air conditioning distributors, one handling the commercial and larger type of building installation, the second handling the residential work. We feel that the commercial type of installation will gravitate to the channels of selling now followed by the heating and ventilating trade, i.e., consulting engineers, architects, and the stronger contracting organizations. On the other hand, residential air conditioning will be handled better by the class of contractors and distributors in the present house heating field.

EDGAR F. WENDT,  
President.

### Room Units Only Temporary Expedient, Teppen Feels

The Cooling Tower Co., Inc.  
15 John St., New York City  
Dec. 30, 1936.

Editor:

In response to your letter of Dec. 15, would say that I believe the total volume of air-conditioning sales to the public in 1937 should be at least 25% greater than in 1936, and present indications are that sales in our part of the industry—the receding of refrigeration water—will show at least a 50% increase.

Ultimately, without a doubt, the complete system taking care of both summer heat and also humidifying the super dry air which we have in our American homes in the winter, will be adopted. The room coolers, room humidifiers, etc., are only a temporary expedient to take care of buildings which were not designed for centrally operated systems.

I hesitate to comment on the fifth and sixth questions in your letter as we do not sell air-conditioning systems "as such." I do feel, however, that those selling these systems should not only make clear the advantages, but also should caution the users against the pit-falls of air conditioning, for instance, a system in order to operate properly must either have an ample water supply (in several cases air conditioning has been put in where this supply did not exist) or should have recirculating—furthermore, the householders should be advised not to attempt to keep the temperature at say 68° with the outside temperature around 95 or 100°—such an attempt is not only hard on the equipment but the sudden change in temperature on leaving the building is not conducive to good health. In other words, the air-conditioning field which may be the greatest advancement in modern housing, should not be promoted on a "cure-all" basis nor entered into without careful study of the subject.

A. B. TAPPEN,  
President.



### 'The Father of Air Conditioning'

UNLIKE the automotive, radio, and other industries that have caught the public's attention, the air-conditioning industry has evolved few individuals who gained the spotlight.

Best-known name, probably, to both the public and the industry itself is that of Willis H. Carrier. Known popularly as the "father of air conditioning," he is credited with much of the original engineering and application development work upon which the principles of the art are founded.

The year 1936 was heralded in some quarters as the "25th Anniversary of Air Conditioning" because in 1911 Mr. Carrier presented a paper before the A.S.M.E. presenting the principles which formed the basis of air-conditioning practice. This year Mr. Carrier prepared a paper for a joint A.S.R.E.-A.S.H.V.E. joint session reviewing some of the progress of the art in the past 25 years.

First part of Mr. Carrier's paper is presented on this and the following page. Second part of the paper which treats in detail advancement made in the past 25 years will probably be published in the next issue.

## - AIR CONDITIONING ENGINEERING -

### Carrier Recalls Pioneers and Traces Industry Progress

By W. H. Carrier  
Chairman of the Board, Carrier Engineering Corp.

OUTSIDE of the engineering profession, which has been interested for many years in the problems of ventilation, air conditioning today is considered a new art. That it is not a new art is sufficiently attested to by the fact that just a quarter of a century ago it had been sufficiently developed from an engineering and commercial standpoint to attract the attention of the Program Committee of the American Society of Mechanical Engineers. So, to the writer's surprise, an urgent request was received from that society to prepare and present a paper on Air Conditioning. The date of this request was the spring of 1911.

#### PIONEER MANUFACTURERS

At this time there had been organized at least three concerns wholly or partly in the air conditioning field, S. W. Cramer, Charlotte, N. C., in the textile field, Warren Webster & Co., Camden, N. J., who had started an air conditioning department, and the Carrier Air Conditioning Co. of America, incorporated in 1908 as a subsidiary of the Buffalo Forge Co. In addition, there were also a few contractors who had become interested in air conditioning and had made some installations. Most notable among these was W. L. Fleisher, who has since contributed considerably to the art.

That date probably marks the first recognition of air conditioning as a distinct art in the engineering profession, while the present date, exactly 25 years later, properly may be chosen the date of the first general and recognized public acceptance of air conditioning as an essential factor among the conveniences of our modern material civilization. Not only does this acceptance now prevail among all classes in America, but it is also most assuredly reached in all parts of the civilized world, especially in the countries which the writer had occasion to visit recently, South Africa, India, Japan, Australia, as well as Europe.

Therefore it may not seem amiss at this time to outline first the state of the art at the time of the first engineering presentation 25 years ago, second, the history of the developments that led up to the existing status and, third and more especially, to point out the significance of certain vital developments which have made possible its recent general acceptance.

#### FIRST TREATISE

As a result of the request from the American Society of Mechanical Engineers for a paper on air conditioning, a treatise was prepared by the author entitled Rational Psychrometric Formulae—Their Relation to the Problems of Meteorology and of Air Conditioning. Since an intensive study had been made by the writer on this subject during the previous 9 years, it was necessary only to assemble and arrange experimental facts and mathematical deductions to put it in shape for presentation.

However, upon the submission of this paper, the Program Committee immediately added a request for a companion paper to be presented at the same meeting in December, 1911. This was to give a picture of the practical side of air conditioning as well as its more theoretical, mathematical and physical aspects. A compliance with this request was not difficult owing to the availability of previously prepared data. This companion presentation was entitled Air Conditioning Apparatus—Principles Governing Its Application and Operation.

Assistance was given in the preparation of this paper by F. L. Busey. These two papers presented a complete picture of both the theoretical and practical aspects of the art as then practised by the Carrier Air Conditioning Co. Not enough was known at that date about then competitive systems to permit inclusion.

#### CRAMER SYSTEM

The Cramer system was applied almost exclusively at that time to textile mills with atomizing spray units distributed throughout the mill, and with a smaller number arranged to take all or a portion of outside air. The control system originally used wet and dry-bulb thermometers actuating an electric current. Cramer's later and greatly improved form of mechanically operated hygrostat had just been introduced.

As a basis for clear understanding of the state of the art at the time these papers were presented, 25 years ago, a brief history of its development will be interesting.

While the term *air conditioning* has become almost a household word, and so far there seems to be no other substitute which will simply convey the same idea, its origin is not well known. Although the term *air conditioning* was employed as a part of the name of the Carrier Air Conditioning Co., the first company broadly to enter this field, it was actually originated by S. W. Cramer of Charlotte, N. C., whose name has already been mentioned.

About 1907 Mr. Cramer presented a paper before the National Cotton Manufacturers Association on his system of humidification and humidity control for textile mills. He showed how the moisture content of a product followed the moisture content of the air referring to work done by Schlessinger of France and others in this field of study.

From this he argued that the control of the moisture in the air necessarily would control the moisture content in the product. The measurement and control of the moisture content in textiles was then generally known in trade as *conditioning* and he proposed the logical term of *air conditioning* for the means which would maintain a desired humidity in the room where textiles were processed.

#### ORIGIN OF 'AIR CONDITIONING'

Thus the term *air conditioning* applied originally only to the control of the moisture content of the air in reference to its effect on hygroscopic materials. In the adoption of the term the following year, in the name The Carrier Air Conditioning Co., it was intended to have a broader application than this and to include, beside humidity control, air cooling, heating and cleaning, as well as the general control of ventilation.

Since that time others have attempted to broaden or to use the term more loosely, as for example where a disc fan is employed to move the air, or where a warm air furnace is provided with a fan and a moistening means; however, although called *air conditioning*, these last named applications obviously are not in accordance with any true concept of the term.

Like most industries, air conditioning grew as the result of a realized but unfulfilled need. And as in many industries, other developments have been greatly accelerated by the fortuitous discovery of certain basic principles which could be applied advantageously to improvement of the art.

The author's attention was first directed to the possibilities in this field by a late member and past president of this Society, W. S. Timmis, consulting engineer, of New York City. Mr. Timmis had been retained by a Brooklyn lithographer to design, among other things, a heating and ventilating system for his plant.

The lithographer had told Mr. Timmis of his difficulty with humidity, both in winter and summer, and Mr. Timmis had made some study of the possibilities of dehumidifying in summer by use of liquid calcium chloride, as well as by use of condensing coils.

It was recognized by Mr. Timmis that nowhere was there any equipment manufactured for such a purpose, and through J. I. Lyle a request was made to the Buffalo Forge Co. to undertake a series of experiments relating to the possibility of dehumidification of the air in summer by one or both of these methods.

Since the author, who was then an employee of the Buffalo Forge Co., had just completed his first self-assigned research work on heat transmission in air heaters, he was assigned to this project. The experiments were conducted through the summer of 1902 and in the early part of 1903. Aside from some interesting data on greatly increased factors of conductivity of cooling coils in moist air and upon the practical absorption rates of concentrated calcium chloride solution, little practical result was accomplished.

#### RELEASE OF LATENT HEAT

However, specific information of the existing data on atmospheric moisture was obtained, principally from the Weather Bureau's psychrometric tables, and consideration directed to the fact that when calcium chloride or any other substance absorbed moisture out of the air, an exactly corresponding amount of latent heat was released in the form of sensible heat. This phenomenon, submitted in the report at that time, was carefully analyzed.

On account of its heating effect and for other reasons, the use of calcium chloride as a dehumidifying agent was not considered practical. However, the observation of this phenomenon led to a train of thought which eventually was to become important.

#### EFFECTS ON SENSIBLE HEAT

This experiment disclosed the interrelation of latent and sensible heat in the air when its moisture content was altered without the addition or subtraction of external heat. It also led to complementary experiments upon the process of evaporation of water into air and, finally, into the development of the principles upon which air conditioning was founded as presented in the paper entitled Rational Psychrometric Formulae, previously referred to.

It led also to a further study of the need for devising suitable equipment for carrying out air conditioning processes as well as to thought upon the need of various industries for maintaining atmospheric conditions, independently of external weather variations. So in the winter of 1903 and 1904, a spray type of air conditioner was finally devised, suitable for such purpose and with definite means of controlling absolute moisture content of the air leaving the equipment. Thus it became possible definitely to control the relative humidity within an enclosure.

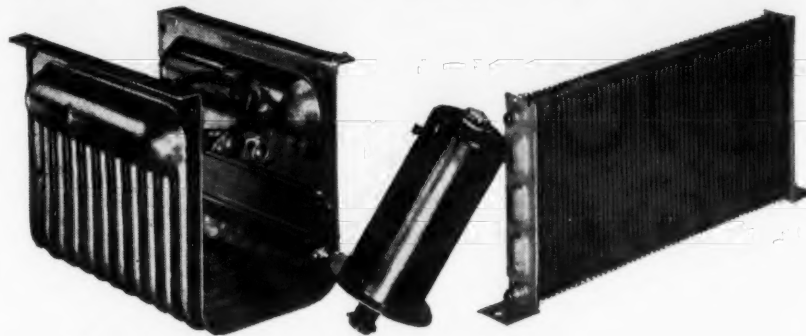
Little thought was given at that time to adapting this same process to the absorption of heat generated

(Continued on Page 36, Column 3)

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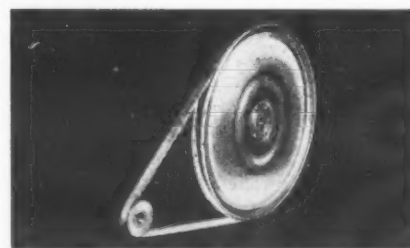
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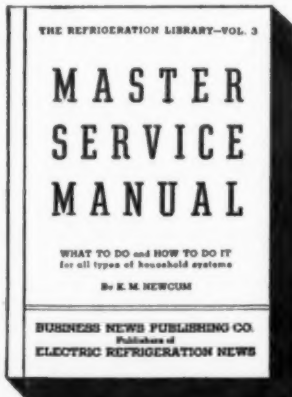
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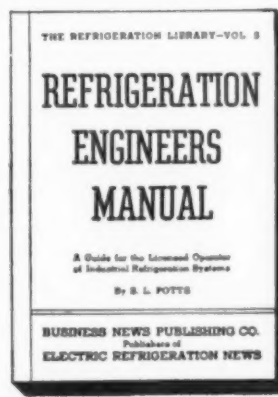
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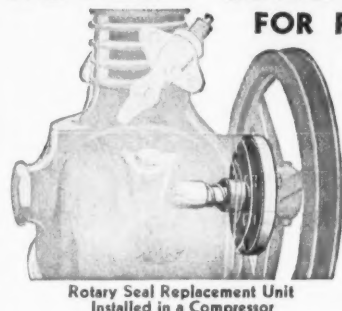
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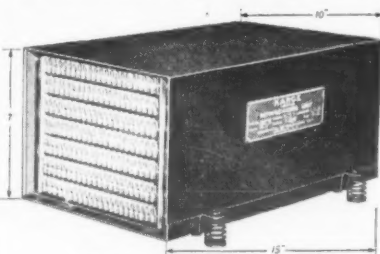
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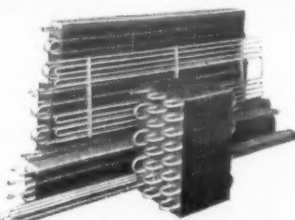
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## Laws Governing Air-Conditioning Practice Were Known to Engineers 25 Years Ago, Carrier Points Out

(Continued from Page 35, Column 3)  
within an enclosure as the necessary and complementary step of true air conditioning. It was not until 1906 that the discovery was made of the necessary relationship between quantity of saturated air supply and amount of heat generated within an enclosure.

This disclosure came as a result of the study of the first application of such a system to a cotton mill located near Charlotte, N. C. Like many discoveries, this when found would have seemed quite obvious from the beginning. Actually it was not.

In this study an interesting fortuitous relationship was discovered between the cooling capacity of saturated air and the relative humidity which could be maintained with varying temperature, that is, that the differential between the dew point of air introduced and the temperature of the room was practically constant for any relative humidity irrespective of the variation in basic temperature.

For a fixed room temperature, of course, this was obvious and was the foundation upon which the basic patent for the dew point method of controlling relative humidity was obtained.

This spray type of air conditioner, with certain modifications, was used about this time also for dehumidification by artificially cooling the spray water and for humidification in winter by heating of the spray water. The general design and features of this early spray type air conditioner are now generally adopted throughout the world. There has been little or no change in the design of its essential features in the past 30 years.

### AIR WASHERS

Air washers for cleaning air had been designed and had come into general use prior to this time. There were three pioneers in the field of air washers whose names should be mentioned, one of which was Joseph McCreery, who first designed an S type of air washer with sprays and eliminators for use in ventilation equipment on boats for the Great Lakes. The principal air washer built at this time was that designed by Mr. Thomas, of Thomas and Smith at Chicago.

This air washer did an excellent job of air cleaning and elimination of free moisture, but the type of sprays employed was not suitable where an exact control of the moisture content was required. There also was a combination of fan and air washer manufactured by Zelwiegler of St. Louis, which seemed, for a time, to have some meritorious features, particularly that of space saving.

The types of eliminators employed at this time, while efficient in air washing, were not adequate for proper separation of a finely divided spray such as proved to be required in air conditioning.

### ROTATION SPRAY NOZZLES

The method of spray production and distribution was also a matter of concern. Some type of nozzle in which the water was distributed and broken up into fine particles by means of centrifugal action was desired for this function. A simple nozzle which already had been developed was selected, operated by hydraulic action, producing a rotating stream of water through the orifice which, upon issuance, burst into fine particles spread over a wide area.

There are two or three methods of producing this rotation, all of which are now in use. The principal requirements in design are simplicity, freedom from clogging, and ease of cleaning.

The general type of nozzle first adopted over 30 years ago is now the one most generally employed. This nozzle was invented actually by a horticulturalist for the purpose of spraying insecticide and supplanted older designs which were found unsatisfactory. It is an interesting illustration of how one art profitably may borrow from another.

### RAPID SPREAD IN INDUSTRY

Following the development of satisfactory equipment and processes of controlling the humidity of air, together with the discovery and analysis of the physical laws involved, there was a rapid development in application to industry starting first with textile mills. Here the problem was always one of increasing, as well as controlling relative humidity combined with cooling, to remove the large amount of heat generated by the textile machinery.

To quote from the introductory paragraph in the paper Rational Psychrometric Formulae: "The application of this new art to many varied industries has been demonstrated to

be of greatest economic importance. . . . In many other industries such as lithography, the manufacture of candy, bread, high explosives and photographic films, and the drying and preparing of delicate hygroscopic materials such as macaroni and tobacco, the question of humidity is equally important."

Mention was also made in this publication of the desirability of application of air conditioning to mines. This will indicate the commercial status of air conditioning 25 years ago.

### LAWS OF PSYCHROMETRY

In this paper a new theory of psychrometry also was outlined, based on the method of determining the temperature of adiabatic saturation. The entire theory was embodied in four significant and four basic laws or principles as follows:

"a. When dry air is saturated adiabatically the temperature is reduced as the absolute humidity is increased, and the decrease of sensible heat is exactly equal to the simultaneous increase in latent heat due to evaporation.

"b. As the moisture content of air is increased adiabatically the temperature is reduced simultaneously until the vapor pressure corresponds to the temperature, when no further heat metamorphosis is possible. This ultimate temperature may be termed the temperature of adiabatic saturation.

"c. When an insulated body of water is permitted to evaporate freely in the air, it assumes the temperature of adiabatic saturation of that air and is unaffected by convection; i.e., the true wet-bulb temperature of air is identical with its temperature of adiabatic saturation.

"From these three fundamental principles there may be deduced a fourth:

"d. The true wet-bulb temperature of the air depends entirely on the total of the sensible and latent heat in the air, and is independent of their relative proportions. In other words, the wet-bulb temperature of the air is constant providing the total heat of the air is constant."

The heat content or total heat of the air was calculated in this paper and was shown to be determined by the wet-bulb temperature. A chart known as the Psychrometric Chart was devised which presented the relationship of wet and dry-bulb temperature, humidity and total heat.

This chart has since formed the basis for all air conditioning calculations, and has permitted an easy solution of all air-conditioning psychrometric and drying problems on the assumption of a standard barometric pressure. Formulae were developed which permitted the construction of similar charts for other barometric pressures or the calculation of special relations not embodied in the original chart.

### ORIGINAL PRINCIPLES VALID

It will be noted that for all practical purposes that these original laws are generally accepted today for engineering purposes. There is a slight error in the assumption that the wet-bulb temperature is identical with the temperature of adiabatic saturation. Only one error was originally considered, and that was the error due to radiation.

It has since been shown that there is another compensating error, which for practical purposes is so slight as to be negligible. This departure is caused by a greater rate of diffusion of water vapor than that of air, so that theoretically it is possible to have a wet-bulb temperature lower than with the temperature of adiabatic saturation. This discrepancy is so small, with water evaporating into air, that it is noticeable only with the most refined thermometer readings.

Actually, as it tends to counteract radiation of air, the wet-bulb temperature reading coincides almost exactly for all practical purposes with the true theoretical temperature of adiabatic saturation. This is a fortuitous relationship existing with water and air but does not hold as well with other combinations. This discovery is the principal contribution which has been made in the theoretical field since the time of the publication of the first paper.

### FURTHER STUDY IN 1924

A further study of the radiation error of the wet-bulb thermometer was presented by the author, with D. C. Lindsay, at the Annual Meeting of the American Society of Mechanical Engineers in 1924. This discussion gives a detailed account of further research done subsequently in this field. The important point is that for engineering purposes in the

field of air conditioning, the relationships given in 1911 are still basic and accurate.

In the design and manufacture of air conditioning apparatus there has been considerable advancement, as might be expected. The early status of the art in reference to apparatus and its application is quite fully given in the second paper, Air Conditioning Apparatus.

The construction of the humidifier and the dehumidifier is still arranged substantially as used in the original design. Improvements occurred primarily in the simplification of control equipment and in methods of water cooling for dehumidification or refrigeration. The dew point method of control probably remains as important as at the date of the first publication. It is now in general use principally because it is a basic air conditioning principle.

### DATA ON HEAT TRANSFER

A considerable portion of the paper Air Conditioning Apparatus was devoted to a mathematical analysis of experimental data on heat transfer, which is important in heating, ventilating and air conditioning fields. It is believed that this was the first engineering publication of the theory of heat transfer between a surface and dry or moist air at varying velocities. Some minor corrections would be made if this theory were to be presented today, but in general time has proven it most useful and accurate.

At the time of writing this paper little use was made of cooling coils or cooling surfaces in air conditioning, and in reality this method has played a part of little importance until the last few years. Today its increasing commercial importance has been made possible by two great advancements; first, in improved surfaces, and second, the introduction within the last 5 years of new refrigerants. These developments will be discussed later.

### 1911 THEORY STILL USED

In the 1911 paper there is complete discussion of the theory of heat transfer and of air cooling and dehumidifying with cooling coils. This same theory is in general use today in determining intricate calculations. The relationship of the increment of latent heat per pound of air to increment of sensible heat per pound of air is exactly the same theory as employed today.

It also shows the by-pass effect of coil surface and the correct method to be employed in calculation of the relative humidity, the moisture content and temperature of the air leaving the coil surface, and emphasizes the discovery that the air is not necessarily saturated. These subjects are discussed in this paper under the headings: Air Cooling and Dehumidifying with Cooling Coils, Rate of Transmission Between Air and Water Where Condensation Occurs, Moisture Content of Air Leaving Surface Dehumidifier, and Theory of Convection with Forced Circulation.

As this publication has been out of print several years, it is much less well known to the engineering profession than the first paper, but in many respects it has nearly equal engineering value today, especially in the light of recent developments toward unitary air conditioning equipment with surface cooling.

### SLOW TO SPREAD

Until 1911 and for 10 years thereafter air conditioning was confined almost entirely to industry. The tremendous effect it was to have as applied to requirements of human comfort and particularly in summer cooling in connection with refrigeration was not realized before that time. For this reason the public has heard little of it until recent years.

This was true in spite of the fact that the author wrote a catalog in 1905 on air washers for the Buffalo Forge Co. in which the advantages of application of this type of air washer to cooling and dehumidifying processes were emphasized. It was predicted that it would be used in the cooling of churches, theatres, hospitals, etc., in the near future. This prediction, while it has been since proven essentially valid as to method, was entirely wrong as to estimate of time required for public acceptance.

Reference should be made to an interesting paper on Early Comfort Cooling Plants by G. R. Ohmes and A. C. Ohmes in the June 1936 issue of Heating, Piping and Air Conditioning. These attempts at comfort cooling range from the use of ice, as early as 1880, to a mechanical refrigeration installation reported in 1898.

The earliest comfort cooling installation using mechanical refrigeration of which the author has heard is that cited at a recent meeting of the Refrigerating Machinery Association by C. W. Vollmann, president, Linde Canadian Refrigeration Co., Ltd., Montreal. Mr. Vollmann tells of an installation made by the English Linde Co. in about 1887 using ammonia refrigeration to cool a Rajah's palace in India.

(To Be Continued in Next Issue)



## Operations of the Silica-Gel Type Air Conditioner Is Outlined by Stark of Bryant Heater

NEW YORK CITY—Principles of operation of the silica gel dehumidifier, and its place in modern air-conditioning work, were described by W. E. Stark, vice president, Bryant Heater Co., before one of the technical sessions of annual convention of the American Society of Refrigerating Engineers held last month in New York City.

"An air-conditioning problem," said Mr. Stark, "is almost invariably a two part problem involving sensible heat removal as one part and latent heat removal as the other part."

"Since the relative magnitude of these two parts is not constant from one job to another or from hour to hour on the same job, and since in a great deal of industrial work rather unconventional relations between sensible and latent heat loads are advantageous, there are a great many cases where there is distinct merit in the separation of the two functions of an air conditioning system which involves heat removal. "In such a system the dehumidifying may be done by bringing the air into contact with a material which will remove its moisture bodily by a process of adsorption or taking it into solution, while the sensible cooling is all carried on at a relatively high level, above the dew point."

### SOLID ADSORBENTS USED

"The so-called solid adsorbents of which silica gel, activated alumina or charcoal and lamisilite are examples, lend themselves nicely to such work. Of these silica gel is the best known and most widely used, but its action and its properties are typical of other solid materials mentioned. The action of the adsorbent is a physical or mechanical one, there being no solution or chemical reaction involved."

The adsorption of water vapor into a solid from the air which carries the water vapor is due in part to condensation on the surface and in part to a difference in vapor pressure.

"When gas or vapor is brought into contact with a solid substance there is a tendency for the vapor to condense on the surface and to go into solution with the solid, but the amount passing into solution in the interior of the solid is usually infinitesimally small."

"All substances have a trace of water, derived from the atmosphere, condensed on their surfaces which does not evaporate even into dry air unless heat is applied. There are solids such as those mentioned which have their surfaces arranged in such a manner that a surprising amount of vapor can be taken up and retained in that way."

### VAPOR PRESSURE EFFECT

"An example of the phase of the action of an adsorbent which is due to vapor pressure difference is seen when a capillary tube is dipped into water. The water is observed to rise in the tube to a height which depends upon the diameter of the tube and the vapor pressure corresponding to the temperature of the water. The pressure on the surface of the liquid in the tube is seemingly less than on the surface of the water in the surrounding large open vessel."

"If it is considered that it is the water vapor component of the pressure which is less inside of the tube, it becomes apparent that if an atmosphere containing a condensable vapor, in which the vapor pressure of the condensable vapor is less than that which would prevail on the liquid within the capillary tube if that capillary tube were dipped in condensate of that particular vapor, a condensation of the vapor will take place in the capillary tube."

"A solid substance like silica gel whose structure is a mass of extremely small capillary tubes will possess that property."

"A solid adsorbent will occlude or adsorb vapor from a gas-vapor mixture until the vapor pressure of the condensing liquid in the capillaries approaches the partial pressure of the vapor in the mixture."

"The amount of adsorption depends upon the partial pressure of the vapor in the mixture and upon the temperature of the adsorbent as well."

### PROCESS REVERSIBLE

"This process is reversible in that the adsorbent can be freed of absorbed moisture, or reactivated, by passing through it a stream of heated air, which raises the vapor pressure of the liquid in the capillaries and so drives it out to be carried away by the air stream."

"Naturally the residual moisture left in the adsorbent after activation is that corresponding to equilibrium between the vapor pressure of the heated liquid in the capillaries and the partial pressure of the vapor in the reactivating air."

Since adsorption of vapor within the capillaries seems to be actually a condensation to liquid, heat is released in an amount equal to the latent heat of the adsorbed vapor, declared Mr. Stark.

"In addition to the latent heat which is released and which reappears as sensible heat in the dried gas-vapor mixture, an extra amount of heat known as the heat of wetting is released," he said.

This may amount to about 200 B.t.u./lb. in the case of water vapor, and can be looked upon as representing work done upon the water vapor. Therefore the adsorption of a pound of water vapor from a mixture having a dew point of let us say, 60° F., represents the release of 1,057.8 B.t.u. of latent heat plus 200 B.t.u. of heat of wetting, or a total of 1,257.8 B.t.u. as the total heat of adsorption.

### CHARACTERISTICS OF COMMON SILICA GEL

The solid adsorbent which has so far been most widely used in air conditioning work is silica gel. Its capillary structure is ultra-microscopic, the character of the structure being deduced from the results obtained rather than from actual observation. However, it can be estimated that the surface of the capillaries in one cubic inch of silica gel is on the order of 50,000 sq. ft. and that the volume of the capillaries is 50 to 75% of the total volume of the solid.

### WHAT SILICA GEL IS

Silica gel is a manufactured product, being made by mixing in the proper proportions and at the proper temperature, sodium silicate (water glass) and sulphuric acid. The mixture sets to a hydrogel, which is then washed free of salts and excess acid, dried, broken up and sized; and finally dried or activated down to a very low moisture content. The finished gel is silicon dioxide chemically but structurally it is a skeleton-like mass enclosing a vast number of pores or capillaries.

It has the appearance of small particles of quartz, and as used for air conditioning is sized from about 8 to 16 mesh. Due to the tremendous internal surface of the capillaries its action in adsorbing vapor is probably a combination of true capillary and surface adsorption.

Mr. Stark explained how at a given gel temperature the equilibrium moisture concentration varies directly with the vapor pressures, or that it increases as the relaxation of the partial pressure of the vapor in the mixture to the total pressure increases. It is a maximum when the vapor pressure becomes equal to the

total pressure. It can also be seen that a constant partial pressure of the vapor in the mixture, the equilibrium moisture content decreases as the gel temperature increases.

For example, at a gel temperature of 100° and a partial pressure of the water vapor of 0.5 inches of mercury (59° F. d.p.) the equilibrium moisture content is 18%; while at a partial pressure of 2 inches of mercury (101° d.p.) it rises to 40%.

Also at a partial pressure of 0.5 inches of mercury and at a gel temperature of 100° the equilibrium moisture content is 18%, while at a gel temperature of 150° and the same vapor pressure it becomes 8%.

### REACTIVATION PROCESS

Reactivation is carried out by passing through the gel heated air, this air heating the gel and also providing the vehicle for carrying away the liberated moisture.

For example, gel heated to 200° in the presence of air having a partial pressure of the vapor of 0.5 inches of mercury has an equilibrium moisture content of 6%. It can be seen that gel could be activated down to a low moisture content by passing through it steam at atmospheric pressure (212° d.p.) superheated to 350° F.

"In practice the condition is dynamic rather than static and does not continue to equilibrium," said Mr. Stark.

"At the beginning of a period of adsorption, the gel may be warmer than the air, due to heat left over from the previous activation. During adsorption part of the heat of adsorption may go into the gel, so heating it."

"In order to economize on gel the ratio of air to gel is kept as high as possible (on the order of 10 ft.<sup>3</sup>/min. of air to one pound of gel) and the gel is reactivated rather frequently, adsorption being stopped long before equilibrium is reached."

"It is characteristic of the action of a bed of gel through which moist air is forced, to deliver practically bone-dry air for a short time, followed by air of a lesser and lesser degree of dryness."

"To keep the moisture removing efficiency of the apparatus high, the gel is taken out of service and reactivated before the moisture removing efficiency has dropped materially."

"Two ways have been employed of bringing air into contact with silica gel so as to remove the moisture carried by the air. One is to carry the gel in suspension in the air, so that during the simultaneous travel of the two, the air contacts the gel for a sufficient period of time to do the necessary dehydrating. The gel is then separated from the air, reactivated, and the process repeated."

### BRINGING GEL AND AIR INTO CONTACT

"The other method, and the one universally used today, is to support the gel in screen trays through which air is forced. The spent gel is then either carried bodily into the path of the reactivation medium, or the gel is left in place and the activation medium directed through it."

"In the first case, that in which the spent gel is carried bodily into the path of the reactivation medium, the gel trays are carried on a revolving drum, which carries each tray successively through the path of the air to be dried, then through the path of a stream of air which cools the gel down to the temperature at which it will once more start to adsorb."

"In the second case, that in which the gel is left in place and the reactivation medium directed through it, two batches of gel are used, each carried on its own trays and housed in its own compartment."

"Through the medium of suitable valves air to be dried is passed through one batch of gel and simultaneously the reactivation medium is passed through the other batch of gel."

"At stated intervals the courses of the air to be dried and the reactivation medium are interchanged automatically. Machines are in use embodying both principles."

### HOW THE MACHINE WORKS

Fig. 1 shows diagrammatically how this latter scheme is put into practice in an actual machine. The two batches of gel are each carried on trays arranged in echelon and appropriately baffled so that the air stream is divided equally between the trays of one batch. The supply fan, due to lower valve being in the position shown by the full line, delivers its air to the gel on the right hand side of the machine, through which it passes.

With the upper valve in the position shown by the full line, the dried air leaving the gel is forced out through the opening leading to the dried air outlet. Simultaneously air is drawn in through the activation

(Concluded on Page 39, Column 1)

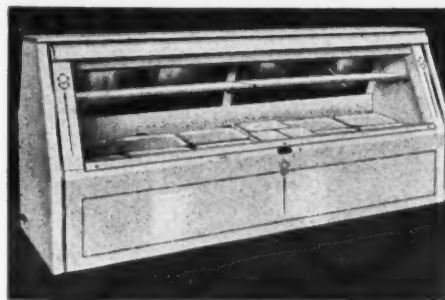
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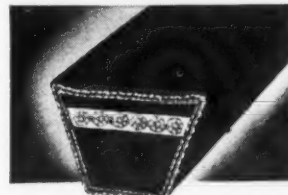
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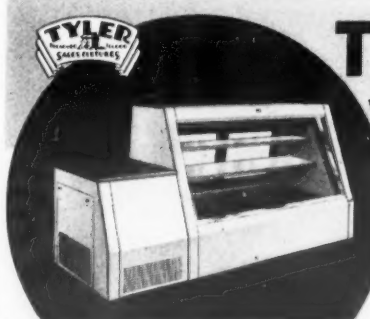
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## Kelvinator Extends Training Program

DETROIT—Extension of its field training program, directed at the education of the selling personnel throughout its dealer organization, has just been announced by Kelvinator's vice president in charge of sales, H. W. Burritt.

The program will be continued over the entire 12 months of 1937 and will cover all Kelvinator domestic products, electric refrigeration, ranges, water heaters, washing machines and ironers, Mr. Burritt said.

Training of sales executives and the instruction of dealers in sales development has been a feature carried on by Kelvinator for some time. This was done by a personnel department, with field men especially assigned for this work. Under a reorganization of the field organization the work will be extended, with 20 district managers devoting especial attention to this work.

## - PATENTS - Issued Dec. 1, 1935

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2,062,728. APPARATUS FOR COOLING AND CONDITIONING AIR. Raney J. Roberts, Detroit. Application March 22, 1935. Serial No. 12,413. 3 Claims. (Cl. 261-119)

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2,062,827. REFRIGERATING SYSTEM. Siegfried Rupprich, New York, N. Y. Application Sept. 9, 1932. Serial No. 632,344. 20 Claims. (Cl. 62-91.5)

2,062,856. REFRIGERATING CABINET. John William Armbruster, East Rockaway, N. Y. Application July 5, 1933. Serial No. 679,021. 4 Claims. (Cl. 312-189)

2,062,857. REFRIGERANT CONTROL DEVICE. Joseph Askin, Buffalo, N. Y., assignor to Fedders Mfg. Co., Inc., Buffalo. Application March 1, 1934. Serial No. 713,578. 7 Claims. (Cl. 137-153)

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2,062,937. THERMOSTATIC VALVE DEVICE. Walter Sabin Root, Jr., Cleveland, assignor to The Bishop & Babcock Mfg. Co., Cleveland. Application June 20, 1934. Serial No. 731,488. Renewed May 5, 1936. 6 Claims. (Cl. 236-34)

2,063,002. LIQUID DISPENSING DEVICE. Lawrence C. Smith, Buffalo, N. Y., assignor to Fedders Mfg. Co., Inc., Buffalo. Application Oct. 5, 1934. Serial No. 747,054. 3 Claims. (Cl. 62-141)

### PATENTS

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## First of Appliance Store Chain Opened in Dallas

DALLAS—First of a chain of five appliance stores which the Grasinger-Kendall Co. will operate in this city was opened recently.

According to S. C. Grasinger, president, the company plans to open four more stores here soon. In addition to Mr. Grasinger, the officers of the firm include: Joe S. Kendall, vice president and treasurer; Fred Schoellkopf, Jr., secretary; and M. F. Carr, general manager.

Mr. Grasinger was formerly associated with the Lone Star Gas Co.; Mr. Kendall was with the Dallas Gas Co.

## Brower Heads Appliance Division of Olmsted

SYRACUSE, N. Y.—Ray Brower, formerly sales promotion manager of the West Coast Philco Co., San Francisco, has been appointed head of the appliance division of the Olmsted Co., Inc., Fairbanks-Morse distributorship here, states Howard S. Kaslin, president.

## Houston Distributor Sells 50 Crosley Xervacs

HOUSTON, Tex.—Fifty Crosley Xervacs, the hair-growing machines invented by Dr. Anne A. Cueto of Cincinnati, have been sold to barber and beauty shops in the city of Houston by Reader's Wholesale Distributors, local Crosley representative. Barbers are charging \$2 per treatment for 30 minutes, Hyman Reader reports.

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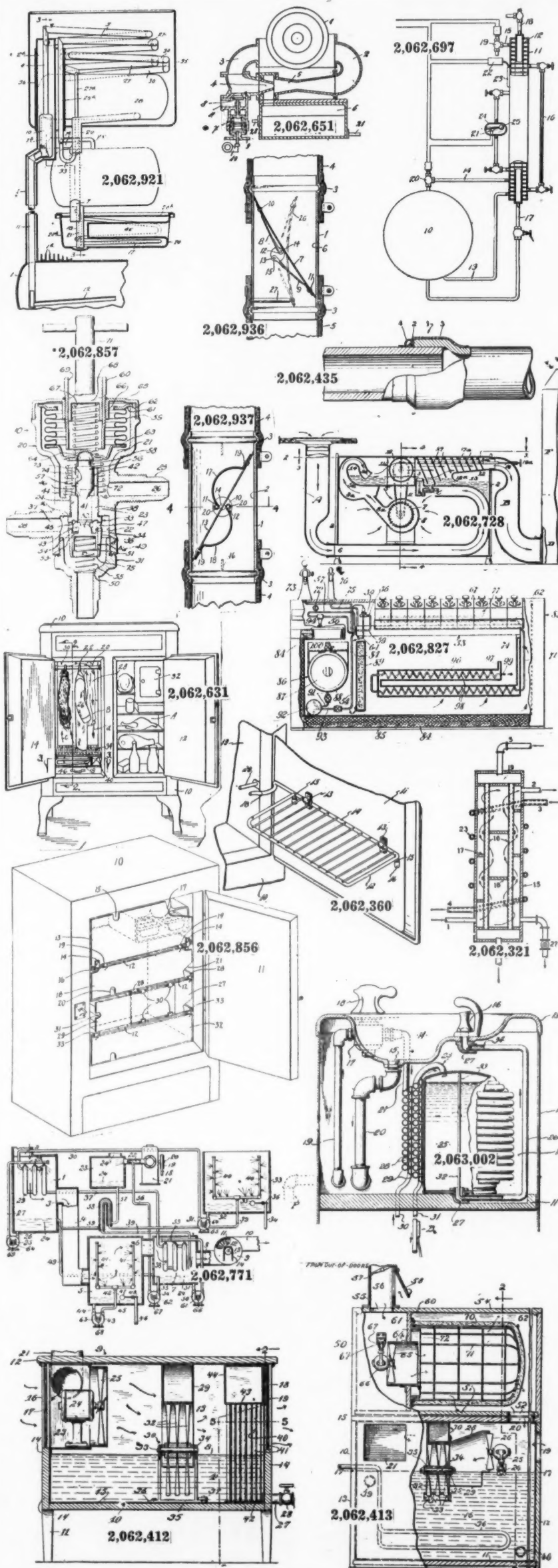
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## Stark Describes Installations Where Silica Gel Systems Are Needed

(Concluded from Page 37, Column 3) air inlet; passed over the activation heater, then drawn through the gel on the left-hand side of the machine where it drives the moisture from the spent gel and finally is drawn out through the opening leading to the inlet of the activation fan.

Throwing the two valves simultaneously to the dotted line position interchanges the two air currents so that the reactivated gel now starts drying air while the spent gel starts undergoing reactivation.

### PARTS OF ABSORPTION TYPE DEHUMIDIFIER

Essential parts of a machine include the two sets of gel trays and the cabinet to house them, two fans and the motor to drive them, the two valves and a small motor to move them, an air heater, and an electric clock timer to actuate the valve moving motor at the appropriate times and to control the air heating means.

In practically all of the machines built today the activation air is heated with gas, the air being passed directly through the gas burner in sufficient quantity to dilute the products of combustion down to a temperature of 325° F. Machines may be and have been built to heat the activation air with steam, oil, or electricity.

"The usual machine built today," said Mr. Stark, "operates on a 10 minute cycle, that is, its valves shift every ten minutes. The air flow is continuous through the two sides of the machine, but the heating of the activation air is intermittent."

"Activation with air heated to 325° and having a dew point of 83° (typical of the 325° activation air is, for example, a mixture of air at a dew point of 70° and products of combustion of natural or manufactured gas), if carried on until the gel reaches a temperature of approximately 200°, leaves the gel with a moisture content of about 7.5%.

### MUST COOL DOWN

"To give it appreciable moisture adsorbing power it must be cooled. The cooling is accomplished by cutting off the heat shortly before the end of the cycle and allowing unheated air to pass through the gel, cooling it down to a temperature on the order of 150° F.

"It is true that during the cooling period there will be some adsorption of moisture from the cooling air, but since this takes place along the lower and flat part of the curve, a very little of the useful adsorption capacity of the activated gel is lost. In practice the heat is applied to the activation air for seven out of the 10 minutes of the cycle, the last three minutes before the valves move being used for cooling.

"Since the gel and the metal holding it are not fully cooled when it is diverted to adsorption purposes, there is a transfer of sensible heat from the gel to the dried air at the beginning of the adsorption period.

"Over a 10-minute adsorption period this produces a rise of some 10° or 15° above the theoretical temperature rise due to the latent heat liberation and the heat of wetting.

"The theoretical temperature rise due to these heats is 0.774° per grain of moisture adsorbed per pound of air, so that by computation the probable average temperature of the dried air leaving the gel can easily be ascertained.

"In Fig. 2 there is shown the performance of a commercial dehumidifying machine using silica gel. Here we have the efficiency of removal (percentage of moisture content removed) plotted against the moisture content of the entering air, for different air temperatures.

"The efficiencies are not instantaneous efficiencies but are the average of those prevailing over a 10-minute cycle. The efficiency varies slightly over the 10-minute period, starting at a figure below the average, rising quickly to a peak, which is above the average, and then tapering off gradually to a value at or a little below the average.

"It can be seen that the removal efficiency is higher at low air temperatures, and at lower entering moisture contents, although the absolute moisture removal varies directly with the moisture content of the entering air.

"The removal efficiency is of course affected by the completeness of reactivation, and is at a maximum value when the amount of heat supplied for activation is adjusted so as to bear the correct relation to the condition of the entering air."

In the conventional way of applying dehumidifying equipment of this kind to a comfort air condition-

ing problem, the ventilation air is almost invariably delivered to the humidifier, from which it issues dry but hot, the heating being due to the liberation of latent heat and the heat of wetting.

There is no actual heat removal in the dehumidifier, in fact there is an increase due to the liberation of the heat of wetting. The action is merely to transform the latent heat of the adsorbed water vapor into sensible heat, in effect raising the level of the sensible heat from the dew point to a higher temperature at which it can be removed by the available water.

Following the dehumidifier is a "dry air cooler" supplied either with city water or with water from a cooling tower. It is in this cooler that the latent heat removal is actually carried out, and if the air is brought down to the entering dry bulb temperature the latent heat removal of the moisture adsorbed by the gel is complete.

If the cooling is carried below the entering dry bulb temperature, there has been a removal of sensible heat as well as of latent heat.

### RECOMMENDED PRACTICE

"In practice it is economical to proportion this dry air cooler so as to cool the air to within 10° F. of the water temperature," said Mr. Stark.

"Hence, if 95° F. air enters the dehumidifier and 85° F. cooling water is available, the air will leave the dry air cooler with the exact equivalent of the latent heat of the adsorbed moisture removed from it.

"The dried air entering the conditioned space picks up moisture, and if the pickup is not equal to the moisture gain corresponding to the desired moisture level, the ventilation air which is delivered to the dehumidifier is supplemented with recirculated air in sufficient quantity to give enough dry air to offset the internal moisture gain, this practice is usually called for. The dried and cooled air is then

### Performance Chart

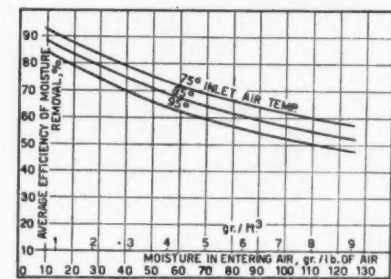


Fig. 2. Performance of a commercial dehumidifying machine using silica gel.

delivered into a recirculation stream, sufficient in quantity to provide the necessary sensible cooling effect for the conditioned space.

"Since there is no moisture removal to be accomplished in the recirculation stream, the "main cooler" can be operated at a temperature higher than usual, such as 55° F., so reducing the size of condensing unit required for a given heat removal and giving a greater capacity per horse power of input, due to the higher suction temperature.

"Dehumidification by solid adsorbents, or by any dehumidifying agent which accomplishes its dehumidifying independently of cooling, has a place in all categories of air conditioning. We may start with the situation in which dehumidifying only, without any particular temperature modification, is required, such as a case in which a supply of dry air at a temperature in the neighborhood of 80° or 90° or even higher, is desired.

"There are many industrial processes in which such demands with refrigeration alone, particularly when dew point below 32° are called for.

"Dehumidifying equipment using solid adsorbents has practically no lower limit so far as possible dew points are concerned. If single-stage adsorption or at most three-stage, will do so.

"Consider a dehumidifier with characteristics similar to those shown in Fig. 2 and supplied with air at 85° and 100 grains. It will remove 56.5% of the entering moisture, leaving a residue of 43.5 gr./lb. If this air can now be cooled to 85°, generally possible with city water, it may be passed through a second dehumidifier which on account of the low entering moisture content of 43.5 gr./lb., will have a moisture removal efficiency of 73%, leaving a residue of 11.75 gr./lb. Suitable interstage cooling followed by a third stage would render possible a final moisture content of 1.47 gr./lb., corresponding to a dew point of -24° F.

"Speaking generally, any situation which calls for a dew point at or

below the freezing temperature is legitimately handled by equipment of this kind, regardless of how gas and electricity costs may compare with each other, although the dehumidifier may many times be rightfully supplemented by electricity.

"There are many special industrial applications where temperatures on the order of 70° and relative humidities ranging from 10% to 25% are desired. This entire range falls below the 32° dew point line but in practically every case, unless exceptionally cold natural water is available, refrigeration also is required to do the necessary sensible cooling.

"Such problems are frequently characterized by the great desirability of maintaining both temperature and humidity constant, despite load fluctuations. Putting the dehumidifier and the condensing unit under independent instrumental control makes it possible to meet all conceivable load swings within the capacity of the equipment.

### APPLICATION WITH HIGH LATENT LOAD

"There is a second group of industrial conditioning problems in which the relation between dry bulb temperature and relative humidity is what might be termed "unconventional," which is the same thing as saying that the latent load percentage is unusually high. These problems are often characterized by stringent control demands accompanied by wide load swings. The border line between this class of problem and comfort conditioning problems is hazy.

"It is, of course, futile to say that these problems can not be handled by refrigeration, for by the proper combination of cooling with reheating by by-passed air, by heat from the condenser, or by steam, practically any desired condition can be produced. However, the control frequently becomes complicated and the operation costly.

### SPECIALIST NEEDED?

"The combination of direct dehumidification with sensible cooling by refrigerating places each task upon the shoulders of a specialist which is able to do its own particular work with the maximum of economy and which is susceptible to independent control by simple instruments. The refrigeration equipment is limited to that required to do the maximum amount of sensible cooling which may be called for. Incidentally it can operate at better than usual economy on account of the higher back pressure which may be maintained.

"The usual run of comfort air conditioning work involves under the design conditions latent load percentages which are rather easily met by refrigeration equipment alone. However, the usual specification which states that a certain indoor condition is to be maintained under the combination of certain outdoor and internal conditions is only an instantaneous specification.

"The use of the conditioned space and the need for comfort are not limited to those instants during which the design conditions occur. In fact, nature may never be thoughtful enough to provide the design combination.

"A specification to be complete and to guarantee the purchaser enduring rather than instantaneous satisfaction should call for the maintenance of desired inside conditions (dry bulb and relative humidity) at all times, and not at just those times when a certain group of load conditions fortuitously coincide."

"The outstandingly poor air conditioning systems are those which are able to meet only an instantaneous specification but which lack the flexibility to meet a continuous specification. It is on the cool but humid days that they fail to live up to specifications and expectations and bring bad repute upon the entire air conditioning industry.

"Independent dehumidifying equipment in the proper amount, together with cooling equipment in the proper amount, makes it possible to meet continuous specifications as easily as instantaneous specifications.

"What the specification should be has been a subject of a great deal of argument, a continuation of which has no place in this paper. However, it happens that our usual inside design conditions are rather easily met (at least instantaneously) by refrigeration equipment alone, a circumstance in which there may be some significance.

### PUBLIC COMFORT IS CRITERION

"Certain researches by a well known laboratory have purported to demonstrate that accurate humidity control has no bearing on comfort and that the sensation of comfort at a given temperature is constant over a wide range of humidities, even as high as 70%. However, the reactions of those who are most important in our eyes, paying customers, not professional observers, indicate that humidity may after all have a bearing on comfort and that lower humidities than those looked upon as conventional, accompanied by higher temperatures, may be desirable."

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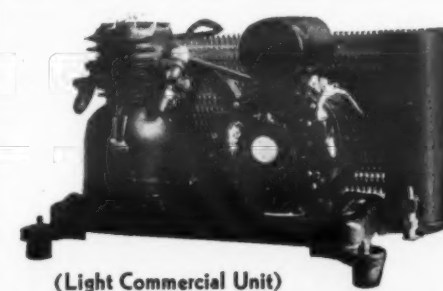
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